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ERRATA.

Vol. 33, No. 2, p. 111, in first line of summary of paper by STÉVENEL & BERNY on the destruction of hookworm eggs and larvae, *for* cyanide of calcium *read* cyanamide of calcium.

Vol. 33, No. 7, p. 561, in first line of summary of paper by IZUMI on a new species of Metagonimus, for *Metagonimus katuradai* read *Metagonimus katsuradai.*

Vol. 33, No. 12, p. 942, translation of title of PEREIRA's paper should read " Witebsky, Klingenstein and Kuhn Test in Leprosy."

BUREAU OF HYGIENE AND TROPICAL DISEASES.

TROPICAL DISEASES BULLETIN.

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THE CARRIAGE OF SCHISTOSOMES FROM MAN TO MAN, WITH SPECIAL ATTENTION TO THE MOLLUSCS WHICH ARE THEIR LARVAL HOSTS IN DIFFERENT PARTS OF THE EARTH.[1]

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Sectional Editor, Tropical Diseases Bulletin.

(Received November 4, 1935.)

That, against the view of Looss, molluscs take a necessary part in the development of schistosomes came sharply to the front with the statement by Kumagawa (1914, **3,** 289–90)[2] of Miyairi's discovery of a larval stage of *Schistosoma japonicum* in a "*Lymnaeus*" species. Leiper and Atkinson (1915, **6,** 296) were unable to get Miyairi's paper through good bookstores in Japan, but their investigations there made it clear that the development of this trematode from miracidium to cercaria took place in a mollusc, named in an addition to their paper *Katayama nosophora* Robson, 1915, after the place from which it had come. While in 1907 Sambon[3] had, from its form, given the name of *S. mansoni* to the egg with a spine at the side, it was Leiper (1916, **7,** 347) who gave proof, not only that the two sorts of egg came from worms which when of full growth had a different structure, but that the carriage of the two species from man to man took place in Egypt by

[1] But for the words necessary for biology, parasitology and medical science, which have not so far been covered by the system, this paper "unless otherwise indicated thus" is in Basic English, keeping to 850 words in the general list and those in the short special lists for general science and chemistry or in general international use. The writer is of opinion that only in some such way may material in this *Bulletin* be made of the most value for those whose language is not English. He is under a strong sense of debt to Professor C. K. Ogden and Miss L. W. Lockhart (of the Orthological Institute, 14, Dartmouth Street, London, S.W. 1, and 10, King's Parade, Cambridge) for most kind help on this point now and in the past.

[2] References, unless otherwise stated, are to summaries in this *Bulletin*, the first figures giving the year, the second, in blackface type, the volume number, and the third the page of the *Bulletin* containing the summary in question. Where the year of publication of the original paper differs from the year of publication of the *Bulletin* summary, two dates are given—the first in brackets referring to the original paper, and the second to the *Bulletin* summary.—Ed.

[3] *Jl. Roy. Soc. Public Health*, **15,** 303.

molluscs which zoological grouping had placed in different genera. Now the units of zoological grouping are man-made, and the ideas of different men on the facts which may rightly be used for this purpose, are not the same. The base used here is individual and anatomical, such as that put by SANDGROUND ((1934) 1935, **32,** 300) in these words: " In order to establish a new species safely, it is necessary to point out constantly present, and if possible easily recognizable, zoological characters by which it may be distinguished from related forms." Zoology is one, and though there is a division into such " races " as Hebrew and Nordic, Hottentot and Negro, Mongol and Latin, *Homo sapiens* in the view of anthropologists is one species; and the same range of qualities in the species has to be kept even for molluscs and worms.

The best chain of facts which may be offered in support of the view that a certain mollusc is the intermediate or larval host of a certain schistosome is that put forward by GORDON, DAVEY and PEASTON ((1934) 1935, **32,** 237). Their molluscs were of laboratory growth, so that unnoted natural infection was not present, infection was given by miracidia from eggs whose species was certain, and the cercariae coming from the molluscs gave the infection to clean animals, as was made clear when worms of full development were seen in the veins.

THE GENUS SCHISTOSOMA[4] IN MAN.

In addition to the three blood flukes of which man is the optimum host (*S. haematobium, S. japonicum* and *S. mansoni*) man has been said to be a harbourer of others; a decision has to be made on this point before going into the question of carriage. In some cases this statement has been based on the size and outline of the egg; then again the morphology of cercariae which have come out of a mollusc has been used to put that animal among the larval hosts of a schistosome of man. Are these beliefs true?

A. The egg in the diagnosis of the species of man's schistosomes.

The size of the egg.—It was noted by CORT ((1915) 1916, **7,** 353) that eggs of the fluke *Pneumonoeces similiplexus* were very different from one another, the greatest being 33 per cent. longer than the smallest. Again it was noted by VEGLIA and LE ROUX ((1929) 1931, **28,** 195) that BERTOLINI, in 1908, gave these mean dimensions (in millimetres) for the eggs of *S. bovis*: in the worm's uterus 0·145 by 0·037, in the wall of the intestine 0·188 by 0·044, and in the faeces 0·230 by 0·056. Measuring is no use as a test for species if facts such as these have not been taken into account.

The outline of the egg.—Now that time has given proof that Sambon was right in making *S. mansoni* into a new species for this reason, other attempts in this direction have been made from time to time.

[4] The " valid name " of the genus is put by SENN ((1931) 1932, **29,** 167) as *Bilharzia* Meckel, 1856, that name being earlier than *Schistosoma* Weinland, 1858, *Gynaecophorus* Diesing, 1858, and *Bilharzia* Cobbold, 1859. But by Opinion 77 of the International Commission on Zoological Nomenclature the name *Schistosoma* is on the Official List of Generic Names, and it is the valid name while it is on that list.

The Schistosomes Named from the Egg.

S. incognitum Chandler, 1926.

Chandler ((1926) 1927, **24,** 174) made the discovery of schistosome eggs in faeces resting on the earth near Krishnagar, Bengal, India ; this place was used for defaecation by man, and the faeces in question had the look of those of man ; so his opinion was that schistosomiasis of man was present in India, and the species was named by him *S. incognitum*. This place was near to a group of houses of pig-keepers, whose pigs went to it frequently to take as food the faeces of man. Chandler made a like discovery at Kalimpong on the lower slopes of the Himalayas, and in this place, as in the other, pigs were common. The material inside these eggs was without structure. Saunders ((1934) 1935, **32,** 247) gave an account of schistosome eggs in pig's faeces, which in his belief were the same as those seen by Chandler. He gave the parasite the name *S. suis*, a synonym if his belief is right. An explanation of the fact that there was no structure in Chandler's eggs may be that while in the parent worm they had got into the alimentary canal of some person or some animal, and their protein structures had undergone digestion before they became part of the faeces.

There is then no good reason for the belief that these eggs came from worms which were parasites in man, and much for the suggestion that they did not.

S. faradjei Walkiers, 1928.

An account came from Faradje, in the Upper Welle, Belgian Congo (Walkiers, 1928, **25,** 945), that in five of a great number of investigations of faeces there were seen eggs with no spine to them. In his discussion of the paper, Rhodain said that such eggs had been seen in Egypt and the Sudan. Later it was pointed out by van den Berghe ((1934) 1935, **32,** 242) that even the size of the eggs had not been given by Walkiers. There is no proof at present that the name is that of a separate parasite of man.

S. bovis Sonsino, 1876 and *S. mattheei* Veglia and Le Roux, 1929.

Two questions come up here.

1. *Are* S. bovis *and* S. mattheei *different*?—Veglia and Le Roux made *S. mattheei* a separate species by reason of the size and habitats of the worms, and the form of the eggs. But while noting that living worms which are dropped into certain solutions undergo much contraction, they kept their worms in normal salt solution (in which they do not) till death came about, but gave no account of any attempt to see that the size of *S. bovis* as given by other workers and taken as right by themselves was measured in these special conditions. It would be surprising if it had been, so that this support for their suggestion is not good. In the first account of them the eggs of *S. mattheei* were said to be oval or fusiform with a well-marked spine at the end but Blackie (1932, **29,** 401) when picturing the egg made a selection of one representative of *S. bovis*. As to habitat, Veglia and Le Roux say that " their new species has never been found invading the urino-genital organs nor producing lesions as recorded for *S. bovis* by Sonsino, Khalil and others." But it was pointed out by MacHattie, Mills and Chadwick ((1933) 1934, **31,** 114) that Sonsino made in fact no statement that *S. bovis* was a parasite of the genito-urinary system—it is a parasite of the intestine ; in addition, after looking at 4,000 examples

of *S. bovis*, they came to a decision that the account of *S. mattheei* given by Veglia and Le Roux is that of *S. bovis* as present in Iraq, that in one per cent. of female *S. bovis* are seen some uterine eggs with *S. haematobium* outline among a number with that of *S. bovis*, and that in 0·2 per cent. of female *S. bovis* there are eggs of *S. haematobium* outline only, that *S. mattheei* is a synonym of *S. bovis*, and that " one of the great difficulties in the elucidation of this problem is the desire of workers to create new species on what appears to us to be the most trifling variations—variations which in other members of the animal kingdom would be considered of no significance." How like this view is to that of SANDGROUND (see above p. 2)!

2. *Are these forms, even if separate, parasites of man?*—It was noted by MACHATTIE, MILLS and CHADWICK that though eggs with the outline of those of *S. bovis* have come from man (see CAWSTON (1921) 1922, **19,** 204) this has only been so when in addition those of *S. haematobium* were present. Again, these workers have seen such eggs, frequently with development not complete, in " tribal " Arabs in parts of Iraq where there has been no discovery of *S. bovis* after very detailed investigation. In addition they give a microphotograph of a uterus of *S. bovis* in which are two eggs side by side, and partly covering one another, one with the outline of *S. bovis* and the other with that of *S. haematobium*; they have been unable to get infection of man with *S. bovis*, and they make the point that there is no experience of full growth, in an animal, of *S. bovis* from an egg in man's urine which has that special outline. Their view is that when the shell gland is not normal there may come into existence in it some eggs having the outline of those of another species of schistosome, and that *S. bovis* is not a parasite of man. Even so, in view of the general behaviour of parasites in non-optimum host species, there will not be agreement that the last is a statement of a completely unchanging rule. These writers have again and again seen an infection caused in *Bulinus truncatus* by miracidia of *S. bovis*; and in Corsica its larval host is *B. contortus* (BRUMPT (1929) 1930, **27,** 465).[5]

S. intercalatum Fisher, 1934.

In giving this name, FISHER ((1934) 1935, **32,** 239) had in mind those schistosomes whose eggs have a spine at one end and which are the cause of intestinal symptoms only. That there may sometimes be seen eggs with this outline in the faeces, and eggs with the spine on the side in the urine, is common knowledge; but that end-spined eggs may, in Equatorial Africa only, be limited to the faeces was first pointed out by LEGER (1923, **20,** 619). The same experience is that of CHESTERMAN (1923, **20,** 939) and of SCHWETZ and BAUMANN ((1930) 1931, **28,** 194) round about Stanleyville, Belgian Congo; of CHARLIER and CHARLIER-COLLON from Kisale-Katanga, Belgian Congo; of NESSMANN and TRENSZ (1928, **25,** 946) from the Gabon in French Equatorial Africa, which is west of the Belgian Congo; of FRANÇA ((1925) 1928, **25,** 456) from Angola and W. Africa, with some support for the view that *Physopsis globosa* is the larval host, though *Planorbis pfeifferi* is very common there; of LEGER (1923, **20,** 619) from Senegal; and of LAGRANGE (1920, **16,** 135) in a boy who had it seems journeyed across most of Equatorial Africa. FISHER's work was at Yakusa, Stanleyville; worms of full development were not seen, because

[5] As noted (footnote p. 8) Baylis makes *B. contortus* a synonym of *B. truncatus*, itself a larval host of *S. haematobium*.

autopsies were not possible. As to development of miracidia in molluscs, these words of LEIPER and ATKINSON (1915, **6,** 296) used in connexion with miracidia of *S. japonicum* are very important. " The 'blunderbuss' method . . . was again relied on. This is, briefly, to submit all likely hosts to an overwhelming infection. The proper host will show a marked, even fatal, susceptibility. . . . *K. nosophora* showed an extraordinarily marked attraction for the miracidia, as contrasted with the other species." In FISHER's belief a *Physopsis africana* subspecies was the larval host of *S. intercalatum*, but he says nothing of any attraction of miracidia to this mollusc, though he does say that he was unable to get any infection to take place in it. A most important unit in the chain of proof is not there at all. The reasons for FISHER's opinion that this was the line of development were these. From *Phys. africana* came cercariae of " human type " with growth to full development in the mouse (*Mus musculus*) ; the " length-frequency " curves of the eggs in the uteri of these worms, and their size, outline and " range of variability " in the faeces of *M. musculus* were the same as those in the faeces of man. The position, in fact, is that in no detail of form were the worms in *M. musculus* certainly different from those in man, that when the sizes of eggs were mapped in curves the top of the curve from the eggs of *S. intercalatum* was between the tops of those from the eggs of *S. bovis* and *S. haematobium*, and that parts of the two other curves were covered by its base and that the outlines of the eggs had details of the two species. In other words, one will frequently be unable, by size or outline, to put a given egg into this species or into one of the others. FISHER made this statement, " If we retain our present criteria of species in this genus we must conclude that the schistosome with which we are dealing is a new species." The opinion that the fact of being as little different as this from others is enough for the making of a new species is not the anatomical one of Sandground, or that of the present writer. In the writer's belief, FISHER's opinion is still without proof, and in VAN DEN BERGHE's ((1934) 1935, **32,** 242) the division lines between *S. haematobium*, *S. bovis* and *S. intercalatum* are not sharp. It may be noted that *Phys. africana* var. is most frequently seen in " calm, shallow, shady water with decaying vegetation," that eggs are present all the year round and that there is ready carriage of the mollusc by a strong current.

S. spindale Montgomery, 1906.

CAWSTON ((1925) 1926, **23,** 246) gave his experience of a boy with a number of schistosome eggs in the urine, most being of *S. haematobium* outline but about 1 in 6 having that of *S. spindale*, " possessing a straight border when viewed from the lateral position, but presenting the appearance of the outline of *S. bovis* when viewed from above." The egg was 0·24 mm. long. If the eggs were those of *S. spindale*, the blood fluke of the Indian cow had got into a South African boy. Another explanation would be a diseased shell gland (see MACHATTIE *et al.* under *S. bovis*). In Bombay the mollusc host is *Planorbis exustus*.

B. The use of the morphology of cercariae for the discovery of the larval hosts of the different species of Schistosomes.

If it were possible to say that any cercaria seen coming from a mollusc was that of a certain species of schistosome, the discovery of

the larval hosts of that species would be simple. Unhappily there is no agreement as to the anatomical details of the cercariae of the schistosomes of man.

For example in *Cercaria haematobia* there have been said to be three "mucin, head, or penetration" glands a side by FAUST ((1920) 1921, **17,** 55), BETTENCOURT and DA SILVA ((1922) 1923, **20,** 218; 1925, **22,** 868; (1928) 1930, **27,** 457), CAWSTON ((1922) 1923, **20,** 941), and ARCHIBALD and MARSHALL (1933, **30,** 674); and five of these glands a side by BLACKLOCK and THOMPSON (1924, **21,** 940), VOGEL (1932, **29,** 409) and GORDON, DAVEY and PEASTON ((1934) 1935, **32,** 237).

For *Cercaria mansoni* the numbers given are five a side by KHALIL ((1922) 1923, **20,** 220), VOGEL (1932, **29,** 409), ARCHIBALD and MARSHALL ((1932) 1933, **30,** 210) and GORDON, DAVEY and PEASTON ((1934) 1935, **32,** 237); and six a side by FAUST ((1920) 1921, **17,** 55), CAWSTON ((1922) 1923, **20,** 941), and FAUST, HOFFMAN and JONES (1934, **31,** 776).

For *Cercaria japonica* all workers give five a side; CORT ((1919) 1921, **18,** 106), CAWSTON ((1922) 1923, **20,** 941), TAKAHASHI (1928, **25,** 950) and VOGEL (1932, **29,** 409).

Two points are, then, clear. Attempts to say, with our present knowledge, that cercariae coming from a mollusc are those of a certain species of schistosome, and that that mollusc is the larval host of that species, are of no value. Secondly, statements of this sort which have been made have to be put on one side. The decision to which we are forced is that at present only *S. haematobium*, *S. japonicum* and *S. mansoni* do in fact come into the picture of schistosomiasis in man.

THE FAR EAST.

Schistosoma japonicum Katsurada, 1914.

Japan.—In the opinion of LEIPER and ATKINSON (1915, **6,** 296) the larval host in Japan was *Katayama nosophora* n. g., n. sp. Robson, 1915,[6] Robson having named it in an addition to the paper, but saying that the name of the genus might have to be changed, the condition of his material being poor. The steps taken in proof that this mollusc was larval host were not the best, because the animals which were used were not of laboratory growth (with the War work had to be stopped suddenly). But on the other hand the very strong attraction which these animals had for the miracidia was present in no other species which was tested, and the cercariae which come naturally from *K. nosophora* became worms of full development in animals. So the writers were in no doubt that the development of the worm was as they said, and with that view there has been a full agreement.

China.—The work of FAUST and MELENEY ((1924) 1925, **22,** 468) was done round the Yangtse River. Near Soochow was seen a mollusc like *K. nosophora*, and when 240 were crushed there came from seven of them fork-tailed cercariae which gave to *M. musculus* infection with *S. japonicum*. For the miracidia these molluscs had a great attraction; 26 of them were still living on the 86th day of the test, 10 had the infection, cercariae from two of them underwent growth in *Mus musculus*, so

[6] The same molluscs have been given different names by different writers. It seems best to give in the body of this paper the names which were used in the papers themselves and in footnotes those which now seem valid.

that 70 days later this was harbouring worms of full development. Bryant Walker of Detroit put the molluscs in the species *Oncomelania hupensis* Gredler, 1881. About Kashing there were, in thousands, molluscs which Faust and Meleney put in the same species and whose attraction for miracidia was great. About Shaohsing were others put by Nelson Annandale of Calcutta in the species *K. nosophora*; and these writers had the same opinion about those they saw at the mouth of the Upper Pearl River fifteen miles west of Canton, all of them being free from infection.

Korea.—No case of infection had come to the knowledge of Kobayashi (1925, **22,** 453).

Formosa.—*K. nosophora* is not present (Mendoza-Guazon). *Blanfordia formosana* is the larval host. (Bequaert (1934) 1935, **32,** 246).

Philippines.—In the view of Tubangui ((1932) 1933, **30,** 210) the larval host is a mollusc " identified as *Blanfordia quadrasi*[7] (=*Prososthenia quadrasi* Möllendorf) by Dr. J. Bequaert of Harvard University."

All molluscs of this group are long and narrow and have an operculum They are not water-livers, but when put in it come up and out of it, and it is while they are so doing that they are attacked by the cercariae swimming in the upper parts. When the top of the earth, to which this journey has taken them, becomes dry, they go down through it to wetter parts, and by doing so and by the shutting of the operculum they may be still living almost three months later Cort ((1919) 1921, **17,** 59), though the time was shorter in those in which infection had first taken place. Because they are not true water animals it is not possible to put them to death by any amount of care in chemical treatment of waterways.

Mediterranean Basin.

Egypt. S. haematobium.—Here Leiper first gave clear proof (1916, **7,** 347 and **8,** 509) that *S. haematobium* and *S. mansoni* are separate species, that their carriage is by different molluscs, and that for *S haematobium* the larval hosts are *Bullinus contortus*[6] Michaud, 1829,

[7] Synonymy of these molluscs (see Bequaert (1934) 1935, **32**, 246). In the view of no authority is *Katayama* now a good name for the genus. *Prososthenia* Neumayr, 1869, was used for fossil amnicolid molluscs from Pliocene beds of S.E. Europe, and Pilsbry's belief is that no Oriental mollusc now living has a place in this genus. *Hemibia* Heude, 1889, was put forward without genotype in place of *Oncomelania* because this name seemed " inappropriate." Under the International Code of Zoological Nomenclature the change of an earlier name for this reason may not be made, so Bequaert made *hupensis* the type species of *Hemibia*, and because it had before this been the type of *Oncomelania*, the name *Hemibia* becomes twice " invalid " as a synonym. *Hypsobia* Heude, 1890, "differs from *Blanfordia* and *Oncomelania* in multidentate marginal teeth of the radula. Quite possibly it is generically distinct, but none of the snails thus far known as hosts of blood-flukes can be referred to it," though the species *nosophora* had in fact been put in this genus. There are two names for the genus, *Blanfordia* and *Oncomelania*, which may possibly be given to this group. Bequaert's view of them is this. " It would seem that the smooth-shelled Oriental Amnicolidae known to act as intermediate hosts of the blood fluke *Schistosoma japonicum* such as *nosophora* Robson, *formosana* Pilsbry and Hirase, and *quadrasi* Möllendorf should be placed in the genus *Blanfordia*. The ribbed-shelled species *hupensis* Gredler may be left in *Oncomelania* if one wishes to retain that name in a generic or sub-generic sense." A medical man has, then, good authority for making use of the name *Blanfordia* for all four species.

B. dybouski Fischer, 1891 and *B. innesi* Bourquignat.[8] His observation like that of Hamilton Fairley and Bahr (Observations on Egyptian Bilharziasis, Part I. Commonwealth of Australia, Department of Defence) was that the colour of normal Bulinus is green-black to brown, but that the apical convolutions, as seen through the shell of molluscs which have the infection are yellow. By LEIPER (1918, **12,** 164) the point was made that molluscs were present in the great and small waterways coming from the Nile, and in the small stretches of water named 'birkets' near groups of houses, while HELMY's view ((1933) 1934, **31,** 383) is that these molluscs come to Egypt every year at the time of high Nile on the plant *Potamogeton crispus*, from the Sudan and places south of this. In the experience of MANSON-BAHR and Hamilton FAIRLEY (1920, **16,** 131) the infection rate of these molluscs in birkets was greatest in December, and in their belief oviposition took place in July and August. For the destruction of molluscs by physical methods LEIPER's reading of the facts (1923, **20,** 862) was that in Egypt control of the disease might be got by the use of " rotations " in irrigation, the outcome of which would be the death of *Bullinus*[6] in great numbers, as the result of drying. But that this is not the necessary outcome is seen from BARLOW's field work (1933, **30,** 674) ; because on drying, Bulinus molluscs take up a position with the shell-opening facing down, while their excretion of an epiphragm of slime makes their drying up even more uncertain. In the end, 50 per cent. of them came living through his tests, all of these being then free from infection. In further tests BARLOW (1935, *Amer. Jl. Hyg.* **22,** 376) found there was 40 times as much *Bullinus*[6] infection in September, before the drying, as in January after it. That loss was possibly, as in Cort's experience with *Blanfordia*, caused in part by more ready death of molluscs which had infection, but certainly in part by death of the larval worms in them. It is clear that Leiper's suggestion as to the good " rotations " do in limiting this infection is only made stronger by the knowledge that their effect is in fact greatest on molluscs which have infection or on the parasites in them. As Barlow says, death takes place in mollusc's eggs on drying. Death of cercariae takes place straight away in chlorinated lime, 1 in 30,000, and in a feeble solution of ammonium sulphate [$(NH_3)_2SO_4$] (LEIPER, 1915, **6,** 437). CHANDLER's experience having been ((1920) 1922, **19,** 209) that after 48 hours in copper sulphate ($CuSO_4$), 1 in 1,000,000, there was death of eight species of molluscs from six genera, KHALIL ((1927) 1928, **25,** 456) made an addition of this salt, for four days and nights without stopping, to the chief stream in the Dakhla Oasis. The outcome was the death of all Bulinus molluscs, and no living one was to be seen six months later. The strength at which the solution was kept may be taken as five parts to a million (KHALIL (1929) 1930, **27,** 366), and in this second paper this observation had gone on for ten months without the discovery of any living molluscs. This parasite is present, in addition in the Baharia Oasis, but not in those of Siwa or Gara, with

[8] From the account of BAYLIS ((1931) 1932, **29,** 408) the valid generic name is *Bulinus* Müller 1781, not *Bullinus* Oken 1815. He makes *B. contortus*, *B. dybowskii* and *B. innesi* synonyms of *B. truncatus* (Audouin 1826). Khalil in fact comes to the same opinion (Discussion, Azim, 1935, **32,** 622) in saying " Bulinus snails have been caused to change from one species to another, and to give rise to intermediate species by cross breeding." As sub-genera of *Planorbis* with their species Baylis gives *Planorbis dufourii*, *Planorbula boissyi* and *P. pfeifferi*, and *Planorbina olivaceus*, *P. guadaloupensis*, *P. centimetralis* and *P. antiguensis*.

their strongly salt water (KHALIL (1933) 1934, **31,** 327). In the Nag Hamadi area of Quena Province (Upper Egypt), only urinary infection seems to be present, with *Bulinus*[6] in numbers but no *Planorbis*. In Alexandria the two infections and the two genera of molluscs are present (ABAZA (1929) 1930, **27,** 437).

S. mansoni.—LEIPER gave proof (1916, **8,** 509) that the larval host of *S. mansoni* was *Planorbis boissyi* Potiez and Michaud, 1838, *P. laurenti* Bourquignat from Kake Timsah and the wet lands near Ismalia being seemingly a synonym. It is present in small waterways, drains and wet lands. In BARLOW's work (1933, **30,** 674) 84 per cent. of *P. boissyi* were still living after drying for 30 days, and this they did by going back into the shell where they were shut in by an epiphragm of slime ; and in his second paper it is noted that infection in them was 20 times as great before drying in " rotations " as after. But here, again, death of eggs took place quickly on drying (KHALIL, 1922, **19,** 649). In Rodah Island, opposite Cairo, there is no *Planorbis* or *S. mansoni* (EL BATASH, 1929, **26,** 971).

Palestine.—*B. contortus* and *S. haematobium* were first noted in this Bulletin in 1918 at Mulebbis, a Jewish colony near Jaffa, in " cisterns and a deep well " (SEARLE (1920) 1921, **17,** 55), while BUXTON and KRIKORIAN ((1922) 1923, **20,** 212) got cercariae from 6 of 64 of these molluscs there. FELIX (1925, **22,** 464) said that there was infection in this place long before the War and made the discovery that 4·3 per cent. of 1,256 boys and girls certainly had the infection. In 2,400 faeces, *S. mansoni* eggs were present in two cases which had possibly come from some other place, because *Planorbis boissyi* had not so far been seen in Palestine ; discovery of two such infections was made in the Tel-Aviv laboratory ; the persons came from Yemen, Arabia ; and this statement is made—" There is no authentic case of intestinal schistosomiasis having been contracted in Palestine " (1932, **29,** Suppl. 68*). On the other hand, *S. mansoni* was seen in two men in Australia, about whom the belief was that they had got it near Jaffa (FAIRLEY and FAIRLEY (1929) 1930, **27,** 454).

Syria.—There is a first record of *S. haematobium* in the State of Damascus. POMMÉ and SABAGH ((1922) 1923, **20,** 213).

Cyprus.—Infection with *S. haematobium* has been seen for years in Syrianokhori and *B. contortus* is present (1932, **29,** Suppl., 73*). LEIPER had made the observation earlier that the distributions of the mollusc and the infection were the same (1928, **25,** 948). It has got as far as Morphou (1933, **30,** Suppl., 112*) but no further (1934, **31,** Suppl., 99*).

Corsica.—*B. contortus* is present (BRUMPT and WERBLUNSKY, 1928, **25,** 458) and its infection by *S. haematobium* has been effected in the laboratory ; and in over 6 per cent. of Senegalese there and in the South of France the infection is present (BERNARD, 1928, **25,** 946). No later statement has come to light, though BRUMPT[9] (in France) has readily given this infection to the hedgehog (*Erinaceus europaeus*).

Portugal.—The discovery of endemic infection with *S. haematobium* in Algarve was made by BETTENCOURT, BORGES and DE SEABRA ((1921) 1922, **19,** 206). Their belief that the larval host was *Planorbis metidjensis* was based on their getting from them fork-tailed cercariae

[9] *Ann. Parasit. hum. et comp.* 1930, **8,** 17–50.

very like, if not the same in structure as, those of *S. haematobium*. FRANÇA and DE MELLO ((1921) 1923, **20,** 216) gave support to this in their statement that this mollusc has a marked attraction for cercariae, and BETTENCOURT and BORGES gave proof by the infection of mice (*Mus musculus*), with discovery three months later of *S. haematobium* in the portal vein system ((1922) 1923, **20,** 218). BETTENCOURT and FIGUEIRA (1923, **20,** 621) give an account of schistosomiasis at Alportel, Algarve, with *Plan. dufourii* present in the water. This in Pallary's view is the same mollusc as *P. metidjensis*, but in FRANÇA's ((1922) 1923, **20,** 621) the two are somewhat different.

Morocco.—BRUMPT ((1922) 1923, **20,** 213) makes comparison between Marrakesh where *B. contortus* is very common and bilharziasis is not common, and Gafsa in Tunis where the conditions are the opposite ; but in the experience of CARROSSE ((1930) 1931, **28,** 188) furcocercariae came out of 5 or 6 per cent. of *B. contortus* in Marakesh ; but not out of *P. metidjensis*, of which there are quite a number. In Tangier, there are *B. contortus* and *P. dufourii* but no schistosomiasis (CHARRIER (1923) 1924, **21,** 198). The infection is present at Erfoud (VIALATTE (1932) 1933, **30,** 209).

Algeria.—The number of *Bulinus* molluscs is becoming less, acid waters are not harbourers of them, and they are not present in the newly-formed En Naro Marsh (PALLARY (1934), 1935 **32,** 243). The great size of Lake Onbeira makes treatment to get it clear of molluscs impossible (GAUTHIER (1934) 1935, **32,** 243). The only centre of *S. haematobium* infection now is the Oasis of Djanet near Tripoli, 24° N., where it is present in *B. contortus*, *B. dybowskii*, *B. brocchii* and *B. innesi* (see further RAYNAUD (1926) 1927, **24,** 515).

Tunis.—The distribution of *Bulinus* is wide, and that of *B. contortus*, *B. brocchii* and *B. dybowskii* is the same as that of *S. haematobium*. *Planorbis philippii subangulatus* is limited to the country between 37°21 N. and 36°33 N. *S. mansoni* has not been seen (ANDERSON (1922) 1923, **20,** 619). In the warm springs of Gafsa there are no larval schistosome hosts ; the temperature above which they are not present is 28°C. (GOBERT (1934) 1935, **32,** 243). *B. brocchii* in " irrigation " canals is probably the wrong-doer (LANGERON, 1924, **21,** 544). A variety of this species was given infection with *S. haematobium* ; the death of all molluscs took place, but sporocysts were present in 1 of 20 (ANDERSON and DE LAGOANÈRE, 1927, **24,** 515).

Tripoli and Cyrenaica.—In the tableland 620 metres higher than the sea there is no schistosomiasis, and nowhere is there *S. mansoni*. *Planorbis atticus* is present. Near Derna *Bulinus* is common and two cases of *S. haematobium* were seen by PATANÉ ((1924) 1925, **22,** 464) ; but the infection is endemic (ZAVATTARI, 1932, **29,** 409), 1·4 per cent. of 606 young persons being the measure of its amount (VIGLIETTA (1934) 1935, **32,** 243). The belief of RIZZO (1927, **24,** 987) was that he had seen the first case of *S. mansoni* infection got in the country. There is a small endemic area of urinary schistosomiasis in Tauorga near Misurata but the only mollusc seen was *Planorbis boissyi libica* ; no proof of any connexion between the two was attempted (PENSO, 1934, **31,** 383). In Fezzan *S. haematobium* was seen in from 60 to 80 per cent. of boys in some places, but its distribution and that of *Bulinus* seem to be unequal (ZAVATTARI, 1934, **31,** 773).

The Rest of Africa.

The Sudan.—Before the start of a watering system in the Gezira Province in 1925, made possible by the building of the Sennar Dam across the Blue Nile, there was almost no infection with *S. haematobium* (Humphreys (1932) 1933, **30,** 207). In two years *Bulinus* species, named as being almost all *B. truncatus* with some *B. forskali*, were present in all waterways of the system, and in three years *Planorbis* species in addition (*P. alexandrinus*[10] and *P. pfeifferi*); after the drying of the waterways and the treatment, with a carbolic acid on the market under the name "sizolin," of the hollows which did not get dry, no living molluscs were seen, and the infection rate became a quarter to a sixth of what it had been. In the White Nile Province infection is by *S. mansoni* ((1931) 1933, **30,** Suppl., 99*). The molluscs are named by Archibald ((1933) 1934, **31,** 112) as being *B. truncatus* (covering *B. contortus*, *B. dybowskii* and *B. innesi*) and *Planorbis boissyi*, *P. pfeifferi*, *P. alexandrinus* and *P. herbeni*[11], and he makes the statement that they are "capable of aestivation in the subsoil for 3 to 4 months and so represent the seed stock of the following rainy season." Again Archibald's statement is ((1933) 1934, **31,** 114) that fruit of the tree *Balanites aegyptiaca* by reason of a saponin is the cause of the quick death of all molluscs when 35 berries are put in 30 litres of water.

Eritrea, Ethiopia, French Somaliland and British Somaliland.—No accounts have come to light.

Italian Somaliland.—There is infection with *S. haematobium* in 30 per cent. of persons who have been there from birth. An *Ampullaria*, but no *Bulinus*, species was seen (Veneroni (1926) 1927, **24,** 515).

Uganda.—The only public notes seem to be those in the Government Medical and Sanitary Reports. It seems that there is knowledge of schistosomiasis only near the Albert Nile, and no knowledge of the larval hosts of the worms.

Kenya and Tanganyika.—*S. haematobium* and *S. mansoni* are present. No statement as to larval hosts has come to light.

Zanzibar.—The suggestion of Cawston (1927, **24,** 987) is that *Physopsis ovoidea*, limited to Zanzibar, may be a species and not a variety of *Ph. africana*,[12] and may be the larval host here of *S. haematobium*; a suggestion with which Mansfield-Aders ((1929) 1930, **27,** 943) is in agreement, but which, it seems, has not been put to the test.

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[10] In the opinion of Major Connolly *P. alexandrinus* is a synonym of *P. boissyi*.

[11] The valid name is *herbini*, as Connolly has said.

[12] Connolly's view ((1934) 1935, **32,** 241), using for the most part his own words, is that between *Physopsis africana* Krauss, 1848 and *Physopsis globosa* Morelet, 1866, the only real difference is that the second has a slight rimation which is only fairly constant. [In other words on the method of grouping used here, the valid name will be *Physopsis africana*.] South of Egypt the oldest name applied to those molluscs of the genus *Planorbis* which are nearly alike is *Pl. pfeifferi* Krauss, 1848. It is seen in the greater part of the continent south of the Kunene and Zambesi rivers, but Connolly has noted typical shells from Northern Rhodesia and Kenya. Other specific names which have been used are *Pl. stanleyi* Smith, 1888 and its synonym, *Pl. bridouxi* Bourguignat; when molluscs from Kaballa were sent to Louis Germain of Paris his view was that "your *Planorbis* from Sierra Leone is evidently near to *pfeifferi* Krs., but still more so to the forms from L. Chad of *bridouxi* Bqt., and it seems more suitable to classify it as that species." (Connolly (1934) 1935, **32,** 241). In other words the expert

Nyasaland.—Judging by attraction of cercariae to molluscs, *Physopsis globosa* is probably the larval host of *S. haematobium* and a *Planorbis* species for *S. mansoni* (CHRISTOPHERSON (1923) 1924, **21,** 198). The only mollusc from which fork-tailed cercariae came was *Melanoides tuberculata.* It is not seen from July to September, and at that time no new cases of infection with one or the other of these parasites came to hand, so that the suggestion is made that it is larval host for the two schistosome species (GOPSILL (1930) 1931, **28,** 188).

Portuguese East Africa.—The two worms are present (PERRET-GENTIL, 1933, **30,** 675).

Madagascar.—For long only *S. mansoni* has been noted (GIRARD (1920) 1922, **19,** 200), infection being greatest in the South Plateau (55·3 per cent. in 170 examples of faeces, RAYNAL (1929) 1930, **27,** 463), but LUTROT (1935, **32,** 624) has now seen the eggs of *S. haematobium* in Tsianipiha and Anjijobe in those who have not been away from the island. No work seems to have been done on molluscs.

Mauritius.—*S. haematobium* is present. The larval host has at last been made clear by ADAMS (1934, **31,** 774) in *Bulinus forskali* which has a great attraction for miracidia and readily undergoes infection. Animal tests were undertaken but without development of worms, possibly, the suggestion was, because the numbers of cercariae used were small (A. R. D. ADAMS, 1935, *Ann. Rep. Bacteriol. Lab. Mauritius* for 1934)—a right suggestion, because when ADAMS put *M. musculus,* for 24 hours in all, in the way of infection by all cercariae coming freely from about 24 *B. forskali,* it got a strong infection with worms which had in all chief details the structure of *S. haematobium* (*Annals Trop. Med. & Parasit.,* 1935, **29,** 255).

Swaziland.—*S. haematobium* is present at levels under 3,000 ft. (1931, **30,** Suppl., 88*) ; and cases of persons coming to hospital are increasing ((1932) 1934, **31,** Suppl. 76*).

Natal.—The knowledge got from the reading of the papers on this question is not equal to their size and number. Some decisions are based on belief that the species of schistosome may be named from the structure of the cercaria. In *Physopsis africana,* from water which had been noted as having the infections, sporocysts were seen which had fork-tailed cercariae inside them (CAWSTON (1915) 1916, **7,** 348). An account of the growth of the worm to full development in test animals of cercariae from *Ph. africana* is given by PORTER (1920, **16,** 131). *Ph. africana* of laboratory growth was given infection with miracidia of *S. haematobium* ; 35 days later cercariae came away (CAWSTON (1922) 1923, **20,** 216), but *Limnaea natalensis* gave no sign of infection ; and he has made the discovery that the molluscs are undamaged by drying long enough to be sent by post (1927, **24,** 986) and may still be living after thirty days in earth (1929, **26,** 790).

Cape Province, Orange Free State Province, Transvaal, Basutoland and S.W.Africa.—No paper upon schistosomiasis has been come across in this *Bulletin.*

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was not ready to put the examples certainly in one species or the other ; Connolly's suggestion [private letter] about near species is that while it would be conchologically incorrect to refer to either of them under the name of the other, the use by medical men of such words as " *Planorbis* of the *pfeifferi* group (or type) " and " *Physopsis* of the *africana* group (or type) " would give to other medical workers enough detailed knowledge for their purpose, a suggestion which seems to the reviewer to be wise and to the point. For this and other suggestions on this subject the writer is very much in Major Connolly's debt.

Bechuanaland.—*S. haematobium* is present (1933, **30,** Suppl., 86*).

Southern Rhodesia.—In the work of BLACKIE (1932, **29,** 401) cercariae were got from natural infections of *Phys. globosa* but infection of *Planorbis pfeifferi* was produced in the laboratory from miracidia of *S. mansoni.* These cercariae came to full growth in guineapig (*Holochilomys brasiliensis*) and rabbit (*Lepus cuniculus*), and in this way proof was got that here the larval host of *S. mansoni* is *Planorbis pfeifferi* and of *S. haematobium* is *Physopsis globosa.* In the small grey monkey of the country, *Cercopithecus pygerythrus, S. mansoni* went to full growth, so this may be a natural host as *C. sabaeus* is on St. Kitts. *Plan. pfeifferi* has a narrower distribution in the Colony than has *Phys. globosa.*

Northern Rhodesia.—" Schistosomiasis is reported from most stations; the subject calls for investigation at an early date." (1934, **31,** Suppl., 71.*)

Angola.—No paper has been seen.

Belgian Congo.—The two infections are present in addition to that noted under *S. intercalatum,* but outside this there seems to have been no work on molluscs as hosts other than a list of them by VAN DEN BERGHE ((1934) 1935, **32,** 242) in which are *Planorbis adowensis* and *sudanicus, Physopsis africana* and *Bulinus forskali.*

French Equatorial Africa.—The chief seat is at Tchad (LEFROU (1923) 1926, **23,** 747). At Dakar 6 of 19 cases of intestinal schistosomiasis were caused by *S. haematobium* and 1 of 140 of vesical infection by *S. mansoni*; there are *B. contortus* and *B. strigosus* at Medina (Upper Senegal) and no *Planorbis boissyi* but 16 other species (LEGER (1923) 1927, **24,** 514).

Nigeria.—The two infections are present. *Physopsis globosa* is frequent in small stretches of water in Kano (GORDON, 1932, **29,** 409). At Kagoro infection took place by *S. mansoni* of Europeans after bathing in water having a connexion with a place where there were *Plan. pfeifferi* and *Plan. stanleyi,* some of the molluscs having infection with fork-tailed cercariae (TAYLOR, 1932, **29,** 742).

Gold Coast.—The two infections are present but do not seem to have been noted in print outside government papers.

Liberia and French Guinea.—Infection is with *S. mansoni,* and from *Planorbis choanomphalus* came fork-tailed cercariae which went into the skin of man (MAASS and VOGEL (1930) 1931, **28,** 194). But *Plan. pfeifferi* has a strong attraction for miracidia of *S. mansoni,* and the cercariae from it have come to full development in monkeys (VOGEL, 1932, **29,** 409); his suggestion is that, as in Sierra Leone, *Physopsis globosa* may here be the larval host of *S. haematobium.*

Sierra Leone.—The work of GORDON, DAVEY and PEASTON ((1934) 1935, **32,** 237) has made it clear, on the lines which have been noted earlier (p. 2) as necessary for safe decisions, that *S. mansoni* has here *Plan. pfeifferi* as larval host, and *S. haematobium* has *Phys. globosa.*

Senegal.—The two species of schistosomes are present. The list of molluscs given has in it *Bulinus contortus* and *B. strigosus* and though there is no *Planorbis boissyi* there are said to be sixteen other species, among them *P. bridouxi* and *P. salinarum* (LEGER, 1923, **20,** 619). LEFROU ((1933) 1934, **31,** 115) gives in addition *B. dybowski.*

The Rest of Asia.

Arabia.—In the laboratory at Aden was seen one case of *S. haematobium* and one of *S. mansoni* in men who had not been across the sea at all (Greval, 1923, **20,** 621). There is knowledge that *S. mansoni* is present at Yemen (Malchi (1924) 1925, **22,** 866).

Damascus.—*S. haematobium* was seen in a Syrian who had never been away from Damascus (Pomme and Abdel Kader-Sabbach (1923) 1924, **21,** 205).

Iraq.—It was hard for Boulenger ((1919) 1920, **16,** 134) to put into agreement the great number of cases of infection with *S. haematobium* in the Arabs with the small number of *Bulinus* molluscs. Clearing water plants and putting a stop to watering of the land for 14 days every three months made their numbers less (Hall (1925) 1926, **23,** 244). A detailed account of their morphology was given by Annandale (1919, **13,** 200).

India.—A footnote by Leiper, at the end of an outline account of a discussion on the reason why this infection is not got in India is to the point: "The absence of the mollusc genus *Bulinus* from the Indian fauna may indicate an alternative explanation to that put forward in this paper." (Milton, 1919, **14,** 141.)

Cochin China.—In the same way men harbouring *S. haematobium* and *S. mansoni* have come freely into Cochin China but without handing on the infection to others.

America.

The only schistosome of man which has larval hosts in America is *S. mansoni.*

Venezuela.—The work of Iturbe and González made it clear in 1917 (**10,** 114) that *Planorbis guadaloupensis*[13] is the larval host, because among all the molluscs which were tested it was in this one only that infection was readily got, it took place in almost every mollusc of this species which was used by them, it went on to the stage of cercariae, and the cercariae came to full development in *Mus musculus.* Quiet river water and canals are its normal habitats (Iturbe (1924) 1925, **22,** 467). In an outskirt of Caracas there was still infection of 25 per cent. of these molluscs nine years later (Hill and Tejera (1933) 1934, **31,** 380).

Porto Rico.—Faust, Hoffman and Jones (1934, **31,** 776) went over the same field as Iturbe and González, with like results, the snail being *Planorbis guadaloupensis* and growth to the stage of full development taking place in "rats." In canals about Guayama 8 per cent. of these molluscs had a natural infection.

St. Kitts.—Cameron made the important discovery that African monkeys on this island had infection with *S. mansoni* ((1928) 1929,

[13] In the abstract of a paper by Faust & Hoffman ((1934) 1935, **32,** 245) are these words: "*Planorbis sensu stricto* applies only to European species, the American forms belong to *Helisoma* Swainson, 1840. But *Helisoma* has been divided into several subgenera, of which *Planorbina* Dall, 1905, contained *glabratus.* But the subgeneric name *Planorbina* was preoccupied by Haldeman in 1842 so cannot be used for this group, and was therefore superseded by Pilsbry in 1934 by the name *Australorbis* which is held to require full generic rank, with *glabratus* as type." The name *glabratus* Say, 1818 has priority of *guadaloupensis* Sowerby, 1821, for the species.

26, 533) and gave a demonstration that the larval host was *Planorbis guadaloupensis* ((1929) 1930, **27,** 267).

French St. Martin.—In the opinion of JONES ((1923) 1924, **21,** 201) the larval host seems to be *Planorbis antiguensis.*

U.S.A.—The case noted in Illinois (SULLIVAN, 1932, **29,** 741) with a number of worms of full development in the urine may not rightly be listed as one of schistosomiasis.

Cuba.—There is no *S. mansoni* infection and no *Plan. guadaloupensis* (HOFFMANN (1922) 1923, **20,** 219).

Central America.—There is no schistosomiasis (RISQUEZ (1921) 1922, **19,** 201).

Dutch Guiana.—The work of Leiper and those working with him made it clear that *S. mansoni* was endemic in Paramaribo that *Planorbis olivaceus* was present in rice fields on its outskirts and in roadside waterways in it, 5 per cent. of them in the town having infection (KHALIL and LEE (1921) 1923, **20,** 940).

French Guiana.—LABERNADIE and MARNEFFE ((1929) 1930, **27,** 441) saw eggs of *S. mansoni* in 65 of thousands of samples of faeces at Cayenne, and all of these persons had been outside the country.

Brazil.—In tests by LUTZ, *Planorbis olivaceus* Spix gave full development, to the stage of cercaria, of the miracidium of *S. mansoni,* while in *Plan. ferrugineus* Spix and *Plan. tenagophilus* d'Orb infection took place but development did not go as far as the cercaria ((1916) 1917, **9,** 271); in animals cercariae went to full development in the mesenteric veins in five to six weeks. *P. olivaceus* has not been seen south of Bahia ((1917) 1918, **11,** 78). In the view of CHRISTOPHERSON (1923, **20,** 941) the molluscs sent him by Lutz were *Planorbis olivaceus* and *Plan. centimetralis* Lutz, 1918,[14] the second from North Brazil. In Sergipe *Plan centimetralis* was, in the belief of CARDOSO ((1923) 1924, **21,** 199), the common larval host. In places in Parahyba this mollusc is present in numbers and almost all of them have the infection. This is quickly becoming wider, and the molluscs in question are *Plan. olivaceus, P. guadaloupensis* and *P. centimetralis.* In tests by Lutz this last is certainly a larval host, because there has been development of cercariae and from these infection of white mice by worms of full development (LUTZ, 1934, **31,** 779). It may be overlooked among the much greater *P. olivaceus.*

AUSTRALIA.

FAIRLEY and FAIRLEY ((1929) 1930, **27,** 454) make note that NELSON ((1912) 1913, **1,** 426) had seen three cases in Western Australia but that Cherry had been able to give infection to no molluscs of the genera *Bullinus,*[6] *Ancylus* and *Planorbis.* There is no need to put in the list of infections the case of HOLLAND and WOODWARD ((1924) 1925, **22,** 465) of a boy of three who had been in the same house in New South Wales from birth and whose urine had eggs, " twice or three times as large as the typical ones, spherical, the clear capsule much thicker, the spine missing."

[14] The specific name as it is used by some writers is *centimetralis,* by others *centrimetralis.* As given to it by LUTZ ((1918) 1919, **14,** 142) it was *centimetralis,* equally in the Portuguese and English accounts, and that is the valid name.

KALA AZAR.

FORKNER (C. E.) & ZIA (Lily S.). **An Outline of the Development of the Theories for the Transmission of Leishmaniasis together with Further Evidence to support a Theory of Direct Transmission of Kala-Azar through the Agency of Oral and Nasal Secretions.**—*Far Eastern Assoc. Trop. Med. Trans. Ninth Congress, Nanking, China, 1934.* Vol. 1. pp. 633–654. With 4 figs. on 1 plate. [129 refs.]

NAPIER (L. Everard). **The Transmission of Kala-Azar in India.**—*Ibid.* pp. 657–665.

ZIA (Lily S.) & FORKNER (Claude E.). **Acute Agranulocytosis—a Previously Unrecognized and Important Complication of Kala-Azar.**—*Ibid.* pp. 667–678. With 7 figs. [16 refs.]

ANDREWS (Mary N.). **A Case of Canine Kala-Azar occurring in China.**—*Ibid.* pp. 679–681. With 2 plates.

The first paper in this series is by FORKNER and ZIA and discusses the possibility of direct transmission of kala azar through the agency of oral and nasal secretions in which they have demonstrated viable leishmania. It is very largely the same as other papers on the same subject by these authors, reviewed in this *Bulletin*, 1934, Vol. 31, p. 656 and 1935, Vol. 32, p. 479. The second paper is by NAPIER, on the subject of transmission of kala azar in India by *Phlebotomus argentipes*. It is in many ways a reply to the first paper and embraces views expressed by the author in a paper reviewed in this *Bulletin*, 1932, Vol. 29, p. 106. The third paper, by ZIA and FORKNER, describes acute agranulocytosis in kala azar, a subject already dealt with by them (this *Bulletin*, 1935, Vol. 32, p. 482). The fourth paper, by Mary N. ANDREWS, records the case of a dog which had a generalized leishmania infection. The dog in question was born in Mukden in 1926 and was brought to Shanghai in 1929, when it appeared to be in good health. In 1931 general enlargement of the glands commenced. In May 1932 the dog was losing ground and was destroyed in July of that year. The only tissues kept for examination were the glands and spleen and in sections of these heavy leishmania infections were found. It seems probable that the infection was contracted in Mukden, an endemic centre of kala azar, rather than in Shanghai where the disease is not known to occur. This is the first record of kala azar in a dog in China.

C. M. Wenyon.

SHORTT (H. E.) & SWAMINATH (C. S.). **The Presence of *Leishmania donovani* in the Nasal Secretion of Cases of Indian Kala-Azar.**—*Indian Jl. Med. Res.* 1935. Oct. Vol. 23. No. 2. pp. 437–439. With 2 figs. on 1 plate.

In view of the work of FORKNER and ZIA on cases of kala azar in North China and their discovery that leishmania occur quite commonly in the nasal secretions the authors have examined from this point of view four cases of this disease in India. In two of these leishmania were found in smears of the nasal mucus which had been taken on the type of probe used for routine nose and throat examinations. The parasites were quite normal in appearance, so that it is probable they are viable, as has been proved in the Chinese cases.

C. M. W.

Gritti (Paolo). Sulla presenza di leishmanie nel rinofaringe di bambini affetti da leishmaniosi. [**Leishmania in the Naso-pharynx of Children suffering from Kala Azar.**]—*Pediatria.* 1935. May 1. Vol. 43. No. 5. pp. 562–567. With 2 figs. English summary (5 lines).

In the adenoid tissue of the rhino-pharyngeal region of three cases of kala azar the author has demonstrated the presence of leishmania. The conclusion is that the lymphoid tissues of Waldeyer's ring form a suitable medium for the development of the parasites of kala azar.

C. M. W.

Shortt (H. E.), Sinton (J. A.) & Swaminath (C. S.). **The Probable Vector of Oriental Sore in the Punjab.**—*Indian Jl. Med. Res.* 1935. July. Vol. 23. No. 1. pp. 271–278. With 1 fig.

That *Phlebotomus sergenti* was the probable vector of oriental sore in India was pointed out by Sinton (1922–27) in his studies on the distribution of sandflies. Later Adler and Theodor studied this sandfly in Baghdad and obtained development of *Leishmania tropica* in its alimentary canal. In one case a volunteer inoculated with flagellates from an experimentally infected sandfly developed an oriental sore. Out of 683 *P. sergenti* dissected in Baghdad two were found naturally infected. As many of these feeding and inoculation experiments had been carried out with caught flies the author decided to repeat the work with laboratory bred flies. This he has successfully done and has shown that *Leishmania tropica* develops into flagellates in the alimentary tract of these sandflies after feeding on oriental sores. A *Macacus rhesus* inoculated into the skin by scarification with flagellates from a sandfly fed 5 days before on a sore developed a lesion in which leishmania were demonstrated. It would appear that the Punjab strain of *L. tropica* develops in *P. sergenti* in a manner indicating a definite host-parasite relationship. *C. M. W.*

Khalil Bey (M.) [Opened by]. **A Discussion on Leishmaniasis in Egypt.**—*Jl. Egyptian Med. Assoc.* 1935. Apr. Vol. 18. No. 4. pp. 203–206.

The discussion related to the endemic focus of oriental sore which had recently come to light near Zagazig to the East of the Nile Delta (this *Bulletin*, 1935, Vol. 32, pp. 81 & 89). *C. M. W.*

Papantonakis (Evangelos). **Observations on Leishmaniasis in the District of Canea (Crete).**—*Ann. Trop. Med. & Parasit.* 1935. July 17. Vol. 29. No. 2. pp. 191–197. With 3 graphs & 1 plan.

The paper describes kala azar and oriental sore in the district of Canea in Crete, the first case from which was described by Archer in a British soldier in 1907. It is probable that at least 50 cases of kala azar occur in the district each year and these have the usual characters of the Mediterranean disease. Two centres, Hagios Ioannis and Koun-Kapi, which are relatively newly-built quarters 1 kilometre and 350 metres respectively from the old town, are the endemic foci of kala azar, which is quite absent from the old town. On the other

hand the old town is the endemic focus of oriental sore. This difference in distribution of the two diseases corresponds with the distribution of the sandflies responsible for transmission. *C. M. W.*

Bulletin de l'Office International d'Hygiène Publique. 1935. Mar. Vol. 27. No. 3. pp. 519–549. La leishmaniose viscérale dans les pays méditerranéens. [**Kala Azar in the Mediterranean Littoral and Elsewhere.**] I. La leishmaniose viscérale dans les colonies britanniques du bassin méditerranéen [Stanton (A. Thomas) pp. 519–524]. II. La leishmaniose en Italie [Lutrario (A.) pp. 525–532]. III. La leishmaniose viscérale au Maroc [Gaud (M.) pp. 533–535]. IV. La leishmaniose au Portugal [Jorge (Ricardo) pp. 536–543. With 2 maps]. V. La leishmaniose viscérale humaine en Tunisie [Anderson (Ch.) pp. 544–547. With 1 map]. VI. La leishmaniose canine en Egypte [Carpano (M.) pp. 548–549].

Copanaris (Ph.). La leishmaniose viscérale en Grèce.—*Bull. Office Internat. d'Hyg. Publique.* 1935. Aug. Vol. 27. No. 8. pp. 1570–1574.

These papers are answers to the questionary sent out to the countries mentioned in the title and are a continuation of the series noted in this *Bulletin*, 1935, Vol. 32, p. 81. Little new information beyond that already noticed in published papers reviewed in this *Bulletin* is given. *C. M. W.*

Marchesi (F.), Crainz (F.) & Scapaticci (R.). **Investigations on the Seasonal Variations of Canine Leishmaniasis in Rome.**—*Jl. Trop. Med. & Hyg.* 1935. Sept. 16. Vol. 38. No. 18. pp. 226–229. With 1 chart. [43 refs.]

The authors discuss the problem of leishmaniasis in Rome, an investigation into which has been in progress. It appears that both the visceral and the cutaneous diseases may be contracted in this city, while one case of the muco-cutaneous form has been recorded. The reservoir of the visceral disease appears to be the dog, for the examination of 861 destroyed dogs during 1934 revealed leishmania infection in 18. During the winter months, December to March, no infections were encountered, but from April to November there was a fairly steady rise till in the last month 6·2 per cent. of 80 dogs examined were infected. *C. M. W.*

Guerricchio (A.). Osservazioni clinico-statistiche sulla leishmaniosi viscerale e cutanea in Lucania. [**Kala Azar and Oriental Sore in Lucania (Southern Italy).**]—*Riforma Med.* 1935. Apr. 27. Vol. 51. No. 17. pp. 626–630. With 10 figs. [16 refs.]

The paper gives an account of kala azar (12 cases) and oriental sore (24 cases) which the author has studied in the province of Matera in Southern Italy. *C. M. W.*

Savagnone (Lucio). Sul kala-azar viscerale degli adulti. [**Adult Kala Azar (in Sicily).**]—*Policlinico.* Sez. Prat. 1935. Aug. 5. Vol. 42. No. 31. pp. 1527–1537.

A description, accompanied by a lengthy discussion, of two cases of kala azar in adults (22 and 37 years of age) from the province of Palermo in Sicily. Both were cured by appropriate treatment. *C. M. W.*

Najera Angulo (Luis). Las leishmaniosis visceral y cutanea y su importancia en España. [**Leishmania Infection in Spain.**]—*Medicina Países Cálidos.* Madrid. 1935. Sept. Vol. 8. No. 9. pp. 421–444. With 3 figs. (maps). [111 refs.]

In this paper the author has collected all the records that have been made of the existence of kala azar and oriental sore in Spain. Of the former disease there have been over 800 cases, the distribution of which is shown on a map. The distribution of the recorded species of *Phlebotomus* is given on another map, while on a third map the distribution of the disease and the sandflies is compared. As regards the disease itself, it conforms in every way with the well-known Mediterranean type of kala azar, the greatest incidence being in very young children 2–3 years of age. The incidence of the disease in Spain is compared with the records from a number of other countries where figures are available. Oriental sore is less common than kala azar, de Buen in 1934 having found records of 27 cases. The author considers that kala azar should be made a notifiable disease in Spain.

C. M. W.

de Buen (Sadi). Nota sobre un caso de kala-azar infantil en la provincia de Huesca.—*Medicina Países Cálidos.* Madrid. 1935. Oct. Vol. 8. No. 10. p. 483.

Molina (Constantino) & Miguel (Antonio S.). Un caso de boton de Oriente en la provincia de Murcia (Abaran).—*Medicina Países Cálidos.* Madrid. 1935. Oct. Vol. 8. No. 10. pp. 481–482. With 1 fig.

Coelho (Joao). Premier cas au Portugal de kala-azar chez l'adulte. [**First Case of Kala Azar in an Adult in Portugal.**]—*Rev. Méd. et Hyg. Trop.* 1935. May–June. Vol. 27. No. 3. pp. 124–126.

Though infantile kala azar has been known for some time in Portugal the first case in an adult is the one referred to in this paper.

C. M. W.

Nattan-Larrier (L.) & Grimard (L.). Les chiens de luxe contaminés dans le midi de la France peuvent-ils répandre la leishmaniose en dehors des foyers de la maladie? [**Possibility of Spread of Leishmania Infection by Pet Dogs visiting the South of France.**]—*Bull. Soc. Path. Exot.* 1935. Apr. 10. Vol. 28. No. 4. pp. 270–276.

Though it is well known that in kala azar districts in the south of France the street dogs are liable to leishmania infection it is not realized that pet dogs during a visit to these districts may contract infections which are carried to other parts of the country. The author calls attention to a number of such cases he has met with in Paris and he knows that similar ones have been encountered in Biarritz and Bordeaux. The possibility that such dogs may be the cause of human infections outside the known endemic areas of kala azar has to be recognized, for it is conceivable that the distribution of *Phlebotomus perniciosus* in France is more extensive than at present supposed.

C. M. W.

Rossi (P.). Sur la présence de *Phlebotomus perniciosus* à Mâcon. [*Phlebotomus perniciosus* **in Mâcon.**]—*Bull. Soc. Path. Exot.* 1935. Apr. 10. Vol. 28. No. 4. pp. 282–284.

The author discusses the distribution of *Phlebotomus perniciosus* in France. Apart from the south of France, where it is well known, it has also been recorded from Dijon and Bron. Its presence at Mâcon is now noted and the author thinks it possible that this sandfly will be found all over France. He draws attention to the danger of the sandfly spreading leishmania infection from infected dogs brought from the south of France. *C. M. W.*

Potchechujev (K.). [**The Incidence of Canine Leishmaniasis in Ashkhabad.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1935. Vol. 4. No. 1–2. [In Russian pp. 112–116.]

The author examined the total canine population of Ashkhabad (Turkestan), numbering 3,385, out of which 97 (2·86 per cent.) proved to be infected with cutaneous leishmaniasis. *C. A. Hoare.*

Donatien (A.) & Lestoquard (F.). Observations et réflexions sur la leishmaniose générale du chien. [**Canine Leishmaniasis.**]—*Arch. Inst. Pasteur d'Algérie.* 1935. Sept. Vol. 13. No. 3. pp. 320–338.

The authors have kept under observation in Algiers 21 dogs which had naturally-acquired kala azar. The result has been to show that for periods of several months dogs known to be infected may show no symptoms whatever of the disease, which is generally recognized by three signs—emaciation, keratitis and dermal lesions. Furthermore, leishmania were demonstrated in the skin of all the dogs even when the skin appeared to be perfectly normal. It is evident that smears made from the dermis can be used for diagnostic purposes, as has been proved by the finding of leishmania in 3 of 24 such smears sent to the laboratory by outside workers. *C. M. W.*

Donatien (A.) & Lestoquard (F.). Notes sur la leishmaniose viscérale canine. [**Kala Azar in Dogs.**]—*Bull. Soc. Path. Exot.* 1935. June 12. Vol. 28. No. 6. pp. 426–431.

With regard to the diagnosis of kala azar in dogs the authors call attention to the regular occurrence of leishmania in the skin of infected animals, even those which have healthy skins and show no clinical signs of their infection. As a rule the parasites are not numerous in the smears from the skin but they are there in proportion to the number of cells present, so much so that it would appear that the cutaneous infection is actually as intense as or even more so than that of internal organs. The authors emphasize the value of the formol-gel and antimony tests in this disease. In the former test they consider that two distinct reactions occur, the one being a gelification and the other opalescence followed by opacity. It is the second, which may occur with or without gelification, which is of significance from the point of view of diagnosis of leishmania infection. *C. M. W.*

Benhamou (Ed.), Faugère (R.) & Choussat (F.). Le diagnostic du kala-azar par les frottis dermiques. [**Kala Azar diagnosed by Skin Scrapings.**]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1935. July 22. 51st Year. 3rd Ser. No. 25. pp. 1326–1333.

The two cases of kala azar in children, 1 year and 8 years of age, in Algeria are described because of the interesting discovery of leishmania in films made from the skin. The diagnosis in the younger child was made by spleen puncture. At the same time, by using a vaccinostyle and avoiding haemorrhage, 5 films were made from scrapings of the dermis on the thigh. In the spleen smears, as also in all 5 dermal smears, leishmania were found. The child was treated and received two courses of neostibosan during which clinical recovery was steadily maintained. During this time films were made regularly from the skin of different parts of the body. In all 14 sites were examined and in films from 12 of these leishmania were found. A dog, apparently in good health, which lived in the home of the child was examined by making smears from a piece of skin removed from the ear. In these leishmania were also found. In the case of the second child spleen puncture failed to give a diagnosis, though smears from the skin succeeded. In this case again, after treatment leading to rapid diminution in the volume of the liver and spleen and general improvement, leishmania were still recovered from the skin on a number of occasions. The importance of the presence of parasites in the skin from the point of view of the spread of the disease by sandflies is commented upon. *C. M. W.*

Dostrovsky (A.). **The Diagnostic Value of Leishmania Vaccine.**—*Ann. Trop. Med. & Parasit.* 1935. July 17. Vol. 29. No. 2. pp. 123–128. With 1 plate.

A vaccine consisting of a suspension of 1,000,000 culture forms of *Leishmania tropica* in 1 cc. of phenol saline solution was prepared and employed in a skin test in which 0·1 cc. was injected intradermally, a simple phenol saline injection being given as control. The injection produced an area of erythema, in the centre of which, in positive cases, an infiltration varying in diameter from 0·5 cm. to over 1·0 cm. occurs. Seventy cases of known infection were tested and a positive result was obtained in 98 per cent. The largest reactions were given by the "tubero-ulcerative" type of sore. Of 70 cases tested as controls there was a positive (+) reaction in 7. It is noted that in old sores leishmania may be difficult to find. In such cases the histological features of excised portions of the lesion may help in diagnosis. It is in these cases that the skin test may be of value. *C. M. W.*

Nattan-Larrier (L.) & Grimard (L.). Etude comparative de trois procédés destinés au diagnostic sérologique du kala-azar. [**Serological Diagnosis of Kala Azar.**]—*Bull. Soc. Path. Exot.* 1935. July 10. Vol. 28. No. 7. pp. 658–665.

The authors have noted that fixation of the complement occurs when serum of a kala azar case is mixed with serum of a rabbit hyperimmunized by the injection of culture forms of *Leishmania donovani.* This phenomenon may be utilized as a test for kala azar by adding progressive dilutions of serum from a hyperimmune animal to a fixed

quantity of the serum to be tested plus complement. After incubation for 1½ hours a haemolytic serum and corpuscles are added to discover whether any free complement is present. If haemolysis occurs the test is negative for leishmania infection. In the authors' hands tested on both human and canine sera the complement fixation test is more certainly diagnostic than either the formol-gel test or the formol-neostibosan test, nevertheless it is their custom to apply all three tests to sera received for diagnostic purposes. *C. M. W.*

Bogliolo (Luigi) & Greco (Zaira). Studi sulle leishmaniosi. IV. Sopra la specificità ed il valore pratico di alcune reazioni umorali per la diagnosi della leishmaniosi viscerale. [**The Diagnostic Value of Serum Tests in Kala Azar.**]—*Ann. di Med. Nav. e Colon.* 1935. May–June. 41st Year. Vol. 1. No. 5–6. pp. 273–285. [43 refs.]

The authors have tested on a number of cases of kala azar and other diseases various serological reactions which are commonly employed to aid in the diagnosis of kala azar. The Brahmachari test, in which distilled water poured on to the surface of serum gives a white ring, they consider of no value whatever. The Gaté and Papacostas (the formol-gel) reaction, though suggestive of kala azar when definitely positive, cannot be regarded as specific. The same is true of Chopra's urea-stibamine test. In the author's opinion it has to be accepted that a diagnosis of kala azar cannot be established by any of these tests.

C. M. W.

Giraud (Paul), Berthier, Ciaudo & Praliaud. Réactions sérologiques de la leishmaniose chez un malade atteint d'endocardite maligne. [**Malignant Endocarditis giving a Formol-Gel Reaction.**]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1935. May 27. 51st Year. 3rd Ser. No. 17. pp. 863–866.

A case with enlargement of the spleen was found to have a serum which gave a very strongly positive reaction with the formol-gel, the urea-stibamine and the peptonate of iron tests. On this account it was thought to be a case of kala azar. The case was, however, one of malignant endocarditis. *C. M. W.*

Marchesi (Franco) & Scapaticci (Riccardo). **On Certain Serological Tests used in the Diagnosis of Leishmaniasis in Dogs.**—*Jl. Trop. Med. & Hyg.* 1935. Sept. 16. Vol. 38. No. 18. pp. 225–226. [10 refs.]

The Brahmachari test for kala azar consists of the addition of one part of serum to two parts of distilled water. It is positive when a precipitate forms. In the formol-gel test of Napier a complete coagulation occurs in positive cases when a drop of formalin is added to 1 cc. of serum. The authors have applied these tests to 100 dogs, some of which had leishmania infections. The conclusion is that the tests are not sufficiently reliable to justify the abandonment of a search for parasites. When in man it is not possible to undertake an examination for parasites more than one type of serological test should be applied. *C. M. W.*

Balasheva (M. T.). [**The Rieckenberg Reaction in Leishmaniasis. 2nd Communication.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1935. Vol. 4. No. 1–2. [In Russian pp. 19–22.]

In a previous investigation in which the Rieckenberg reaction, or adhesion test, was employed for the detection of the incidence of cutaneous and visceral leishmaniasis among the dogs of Old Bokhara, it was found to be positive both in diseased and in apparently healthy animals. In order to eliminate the influence of endemicity from the results, a similar investigation was carried out in Moscow where leishmaniasis is absent. Working with cultures of various leishmanial strains, the author obtained results similar to those in Bokhara : the reaction was negative in 16 dogs and positive in 19. In the course of the investigation it was observed that washed platelets did not take part in the adhesion, that immunization of dogs with leishmanias did not increase the reaction and that the reaction was not specific, since in cross-infections specific differentiation of the leishmanias could not be obtained. *C. A. Hoare.*

Giraud (P.) & Ciaudo. Valeur de la réaction au sulfarsénol (Caminopetros) pour le diagnostic de la leishmaniose interne. [**The Sulpharsenol Reaction in the Diagnosis of Kala Azar.**]—*Bull. Soc. Path. Exot.* 1935. May 8. Vol. 28. No. 5. pp. 379–381.

Caminopetros (J.). Remarques sur la communication de MM. Giraud et P. Ciaudo. " Sur la valeur de la réaction au sulfarsénol pour le diagnostic de la leishmaniose interne."—*Ibid.* July 10. No. 7. pp. 562–566.

Caminopetros in 1934 described a new serological test for kala azar. This consisted in adding the serum to be tested drop by drop to 2 cc. of a 2·0 per cent. solution of sulfarsenol in distilled water. Sera from normal individuals or from cases other than those due to leishmania either produce no change in the solution or a slight turbidity which disappears when the 3rd to the 5th drops have been added. With kala azar sera the turbidity which appears is said to persist up to the 7th drop and sometimes up to the 20th. With a view to testing this procedure the authors have carried out the method on the sera of 100 cases of illness not due to leishmania infection. With these the original claim was substantiated, for a turbidity which appeared with 88 sera disappeared at latest on the addition of the 5th drop. In the case of 7 sera from dogs suffering from kala azar the turbidity persisted to the 4th to 6th drops in 4 cases, to the 7th in 2 cases and to the 10th in 1 case. For sera from 4 cases of human kala azar the turbidity disappeared at the 3rd, 4th and 5th drops. The authors conclude that the test is less reliable than other similar ones which have been proposed.

In the second paper the author replies to the criticism of his method by Giraud and Ciaudo. He points out that they did not carry out the test as advised by him in the first place. It is important to note that in the case of kala azar sera the turbidity which forms in the sulfarsenol solution transforms itself into floccules which sink to the bottom of the tube. Eventually a stage is reached when there is a collection of floccules covered by a perfectly clear fluid. The floccules themselves gradually dissolve leaving finally a clear yellow liquid. It is this deposition of floccules and their behaviour which is diagnostic of kala azar and not the mere production of turbidity. *C. M. W.*

VERDE (Michele). Il valore della ferroreazione di Auricchio e Chieffi per la diagnosi della leishmaniosi infantile. [**Auricchio and Chieffi's Ferro-reaction in Infantile Kala Azar.**]—*Pediatria.* 1935. Aug. 1. Vol. 43. No. 8. pp. 894–904. [32 refs.] English summary (7 lines).

The author has tested the iron reaction on the serum of a number of cases of kala azar and comes to the conclusion that of all serological tests for this disease it is the most reliable. The test consists in the appearance of opalescence when a mixture of 1 cc. of a 1 in 600 solution of peptonate of iron (Merck) and 0·2 cc. of serum is incubated at 37°C. for 10 to 40 minutes. *C. M. W.*

AURICCHIO (L.) & CHIEFFI (A.). Sul meccanismo della reazione al peptonato di ferro proposta per la diagnosi della leishmaniosi interna dell'infanzia. [**The Peptonate of Iron Reaction in Kala Azar.**]—*Pediatria.* 1935. July 1. Vol. 43. No. 7. pp. 745–750. [14 refs.] English summary (6 lines).

The authors conclude that the opacity which is produced by the addition of peptonate of iron to the serum of kala azar cases and which they believe can be employed as a test for the disease is brought about by the high concentration of euglobulin in the serum of such cases. *C. M. W.*

FABIANI (G.) & DENDALE (R.). Valeur de la lactogélification du sérum sanguin comme test de guérison du kala-azar. [**The Lactic Acid Test in Kala Azar.**]—*Bull. Soc. Path. Exot.* 1935. July 10. Vol. 28. No. 7. pp. 560–562.

Comparing the turbidity produced in the serum of kala azar cases by adding lactic acid with that given by the addition of formalin (formol-gel reaction) the author claims that the lactic acid produces its effect immediately it is added to the serum taken at the height of the disease, whereas the formol-gel reaction may not be evident for some minutes. Furthermore during recovery, when the formol-gel test has ceased to give a positive result, the lactic acid test may be still positive, proving that the lactic acid test is actually more sensitive than the other. Neither reaction, however, is absolutely specific for kala azar. *C. M. W.*

CARTANA (P.). Leishmaniose canine. Valeur de la réaction de gélification au formol et de la réaction au formol-stibosane pour le diagnostic. [**The Formol-Gel and the Formol-Stibosan Tests compared in the Diagnosis of Leishmaniasis.**]—*C. R. Soc. Biol.* 1935. Vol. 120. No. 29. pp. 63–65.

The formol-stibosan reaction carried out as described by NATTAN-LARRIER and GRIMARD-RICHARD by adding to 0·5 cc. of serum 4 drops of a 10 per cent. solution of neostibosan in 0·5 cc. of formol has given the author varying results in the case of 200 dogs examined for evidence of leishmania infection in Barcelona. Some sera flocculate almost instantaneously and after a few minutes develop into large clots which fill the tube, others flocculate just as rapidly but do not form clots, others again form smaller floccules which on sedimentation fill not more than half the tube, while others produce much finer

floccules which give merely a deposit at the bottom of the tube. The first three results are regarded as definitely positive. As regards the formol-gel reaction the development of opacity within 6 hours of the addition of formol to the serum is read as positive. Of the 200 sera 44 were positive and of the animals from which these 44 were taken only 5 had visceral leishmaniasis. Of the 44 positive sera 12 were positive to both tests while 32 were positive only to the formol-stibosan test. Of the 200 dogs, all of which were examined post-mortem, only 5 were found infected and all these 5 gave sera positive to both tests, on the other hand not all the dogs giving both tests positive were infected. It would appear therefore that the formol-gel test is more reliable than the formol-stibosan test. *C. M. W.*

D'Oelsnitz. Similitudes et dissemblances cliniques du kala-azar autochtone de l'enfant et de l'adulte. [**Clinical Resemblances and Differences between Infant and Adult Kala Azar.**]—*Bull. Acad. Méd.* 1935. May 21. 99th Year. 3rd Ser. Vol. 113. No. 19. pp. 667–669.

The author calls attention to various differences which he has noted in the clinical manifestation of kala azar in infants and adults, differences which he considers due to the fact that in adults the disease progresses slowly, often with remissions, whereas in children it develops more rapidly and steadily till death takes place. In both children and adults there is a serious danger of intercurrent infections. The chief differences noted are in the temperature curve, the colour of the skin and the severity of the anaemia. *C. M. W.*

Virnich (A.). Kala-Azar bei einem Europäer in China. [**Kala Azar in a European in China.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1935. Aug. Vol. 39. No. 8. pp. 345–347.

The case recorded is that of a 24-year-old Russian who was found to have kala azar in Shanghai where he had been resident 9 months before the illness commenced. Previously he had resided in Pekin. It is not clear where the disease was contracted for Shanghai is not recognized as an endemic focus. The author thinks it is difficult to admit an incubation period of over 9 months. *C. M. W.*

Petrov (V. B.). [**A Case of Kala Azar in an Adult from Tadjikistan.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1935. Vol. 4. No. 1–2. [In Russian pp. 105–106.]

The total number of cases of kala azar recorded in Tashkent since 1928 was 437, the majority (61·12 per cent.) being infants from 1 to 3 years old. In the present report a description is given of a case in an adult who contracted the disease in Tadjikistan. It is the first record from that region. *C. A. Hoare.*

Popov (P.). [**On Papataci Fever, Sandflies and Leishmaniases in Azerbaijan.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1935. Vol. 4. No. 1–2. [In Russian pp. 107–111.]

The author records for the first time the occurrence of papataci fever in Azerbaijan, and reviews the incidence of oriental sore, kala-azar and

canine leishmaniasis in that country. A description is also given of the local species of *Phlebotomus*. Numerous hamsters, *Cricetulus migratorius pulcher*, were examined for the presence of leishmanias with negative results. *C. A. Hoare.*

CHIEFFI (Angelo). Un secondo caso di leishmaniosi infantile osservato a Sassari (associazione malaria-leishmaniosi). [**Malaria and Leishmania Infection associated in Sassari (Sardinia).**]—*Pediatria.* 1935. Sept. 1. Vol. 43. No. 9. pp. 1073–1079. [13 refs.] English summary (6 lines).

The case recorded is from Sardinia and is that of a child 3 years old in which both a malarial and leishmania infection were demonstrated. *C. M. W.*

SEI (Mo Ten). **The Changes of Blood in Kala-Azar.**—*Jl. Oriental Med.* 1935. Apr. Vol. 22. No. 4. [In Japanese. English summary p. 64.]

From a study of cases of kala azar in Mukden the author finds that the anaemia is the result of parasitic interference with the haematopoietic function of the bone marrow. The erythrocytes are thus biochemically similar to those of healthy blood though they are fewer in number. The diminution in number of the white and red cells is not always uniform, the ratio white to red being generally high but sometimes very low. The resistance of the red cells to hypotonic salt solution and saponin is not altered. There is a reduction in the viscosity of the blood, a delay in the coagulation time and an acceleration in the sedimentation of the red cells. *C. M. W.*

PIÉRI (Jean). Deux cas de kala-azar de l'adulte à évolution chronique. [**Two Chronic Cases of Kala Azar.**]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1935. July 8. 51st Year. 3rd Ser. No. 23. pp. 1122–1129.

A record of the history and successful treatment of two cases of kala azar in adults from Marseilles, the one 40 and the other 60 years of age. *C. M. W.*

SMITH (R. O. A.) & HALDER (K. C.). **Some Observations on Dermal Leishmaniasis.**—*Indian Med. Gaz.* 1935. Oct. Vol. 70. No. 10. pp. 544–550. With 8 figs.

The paper describes cases of dermal leishmaniasis of the post kala azar type which have been seen at the School of Tropical Medicine, Calcutta, since NAPIER and DAS GUPTA's accounts in 1930 and 1934. A fibroid type of the disease in which there is thickening and swelling of the fingers is noted for the first time. A leprous type is described and figured, in which an extensive nodular condition of the skin of the face and other parts renders a differential diagnosis from leprosy difficult. In an ulcerative type the nodules have a tendency to break down and ulcerate, in which case examination for leishmania is carried out as in oriental sore. It is noted that, contrary to the general rule that the dermal condition appears some time after apparent recovery from kala azar, one case was seen in which the visceral and cutaneous

infections were present at the same time. As regards treatment of the condition, an advance appears to have been made in the discovery that a course of potassium iodide, which may cause the nodules of some cases to ulcerate, definitely helps the course of antimony. The good effect of iodides before the course of antimony is best seen in the leprous, xanthoma and fibroid types. Individual nodules have been successfully treated with local injections of berberine sulphate. It has been shown that the sandfly *Phlebotomus argentipes* is as easily infected by feeding on the dermal lesions as by feeding on cases of kala azar. They are even fairly easily infected by feeding on the depigmented patches; in fact a diagnosis can more readily be made in this way than by searching for parasites in smears or cultures made from the lesions. In one case, out of 5 attempted, sandflies were infected by feeding on the chin of an individual who had had kala azar 2 years previously and who showed no signs of the dermal infection. The chin was chosen as the lesion of dermal leishmaniasis often appears there first. The paper is illustrated by a number of photographs depicting the various conditions described. *C. M. W.*

Amalfitano (Gabriele). La leishmaniosi cutanea e gli inerenti problemi non ancora risolti. [**Unsolved Problems of Oriental Sore.**]—*Riforma Med.* 1935. Sept. 7. Vol. 51. No. 36. pp. 1351-1358. With 9 figs.

The paper, after a general discussion on oriental sore, describes 8 cases which were seen at a clinic in Rome in the course of a few months. All the cases were from the country east of Rome, an endemic focus of the disease having been brought to light in Abruzzo in 1934.

C. M. W.

Bennett (S. C. J.). **Equine Cutaneous Leishmaniasis: Treatment with Berberine Sulphate.**—*Jl. Comp. Path. & Therap.* 1935. Sept. Vol. 48. Pt. 3. pp. 241–243. With 2 figs. on 1 plate.

A Sudan pony 8 years of age developed on its belly an ulcer with raised edges and central granulation tissue discharging an exudate which dried to form an easily removed crust. The lesion, about 3·5 cm. in diameter, resisted all ordinary treatment. Smears made from the granulation tissue gave an appearance indistinguishable from that obtained from a human oriental sore, the parasites, which were plentiful, being morphologically identical with *Leishmania tropica*. For treatment after discovery of leishmania 4 cc. of a 1·0 per cent. solution of berberine sulphate were injected through 7 or 8 punctures around the edge of the sore. The single treatment brought about a cessation of the discharge and the progressive growth of epithelium over the sore, and though there developed a marked oedematous swelling of the region of the sore the healing continued steadily till at the end of 5 weeks both the swelling and the sore had disappeared. This appears to be the first case on record of what must be regarded as oriental sore in a horse. Leishmania infection of the spleen of a horse which died of an undiagnosed condition was described by Richardson in Uganda in 1926 (*Trans. Roy. Soc. Trop. Med. & Hyg.*, Vol. 19, p. 411). *C. M. W.*

Row (R.). **On the Longevity of *Leishmania tropica* in Culture.**—*Bull. Soc. Path. Exot.* 1935. Apr. 10. Vol. 28. No. 4. pp. 269–270.

In view of papers which have been published recently on the length of time leishmania will survive in culture, the author notes that in his medium, consisting merely of a simple haemoglobin saline solution, he has had survival up to 110 days. *C. M. W.*

Zia (Lily S.) & Teng (C. T.). **Survival, Growth and Flagellation of *Leishmania donovani* in the Presence of Contamination with Bacteria.**—*Chinese Med. Jl.* 1935. Apr. Vol. 49. No. 4. pp. 304–312.

—— & ——. **Resistance *in vitro* of *Leishmania donovani* to Contamination with Bacteria.**—*Proc. Soc. Experim. Biol. & Med.* 1935. Apr. Vol. 32. No. 7. pp. 1010–1012.

By employing as medium a mixture of 0·4 cc. 10 per cent. solution of sodium citrate, 0·5 cc. of human serum and 0·5 cc. of deposit of red cells in place of the usual N.N.N. medium the authors have shown that *Leishmania donovani* from hamsters will not only flagellate but will survive in the flagellate state for a month in association with various streptococci, staphylococci and pneumococci. The only organism which had a detrimental effect was *Bact. coli*. These experiments appear to the authors to afford an explanation of the presence of living leishmania in nasal secretion, as has been demonstrated in cases of kala azar. *C. M. W.*

Liddo (S.) & Bogliolo (L.). Tentativi di filtrazione del virus leishmaniosico (*Leishmania tropica* e *Leishmania donovani*, nelle fasi flagellata ed aflagellata). (Nota sperimentale.) [**Filtrability of Leishmania Cultures.**]—*Pathologica.* 1935. June 15. Vol. 27. No. 524. pp. 383–386. [22 refs.] English summary (9 lines).

Attempts to demonstrate the presence of a filtrable phase of leishmania in cultures of these organisms have failed. *C. M. W.*

Nattan-Larrier (L.) & Nouguès (S.). Les variations du tropisme de *Leishmania donovani* chez les diverses espèces sensibles. [**Tropism in Animals infected with** *L. donovani*.]—*C. R. Soc. Biol.* 1935. Vol. 119. No. 24. pp. 987–989.

In kala azar infections, whether in man or animals, the liver and spleen are always infected and in these organs the leishmania take up typically a position in the endothelial cells. This fundamental tropism for cells of mesodermic origin is common to all animals which can be infected. In addition, however, there is an accessory tropism, the features of which are peculiar to each type of animal. It is the cause of the differences in the character of the infection in different animals. The special features of infections in man, dog, hamster and other animals are discussed. *C. M. W.*

Chung (Huei-Lan). Ueber Zellteilungen bei *Leishmania donovani* enthaltenden Klasmatozyten und ihre Bedeutung bei der Ausbreitung der Infektion im R.E.S. [**Clasmatocyte Cells and Infection of the R.E.S. in Kala Azar.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1935. Nov. Vol. 39. No. 11. pp. 474–482. With 17 figs.

Two normal hamsters and two which were infected as the result of an injection given 2 months before were injected intraperitoneally with the fluid from a heavily infected emulsion of the spleen of a kala azar hamster. Two of the animals were killed 46 hours later and two after 68 hours. Cover glass preparations were made by smearing them on both the parietal and visceral peritoneal surfaces. These were dried and stained with Leishman stain. The most striking feature of these preparations was that in all of them there were present large cells of the clasmatocyte type 90 per cent. of which contained leishmania in numbers varying from 1 to 40 or more per cell. Another point was that many of these cells had nuclei in process of mitotic division which appeared to be proceeding quite normally in the parasitized cells. It would seem, therefore, that not only does the reticulo-endothelial system hypertrophy as a result of the infection but also that a distribution of the leishmania throughout the body may be a result of the actual multiplication of the cells containing parasites.

C. M. W.

Redaelli (Piero) & Prima (Antonio). Problemi anatomici, istopatologici e patogenetici della leishmaniosi viscerale del bambino. Con illustrazione di tre casi. [**The Histopathology of Kala Azar in Children.**]—*Sperimentale.* 1935. Feb. Vol. 89. No. 1. pp. 3–34. [20 refs.] English summary.

From a detailed study of the histopathology of three fatal cases of kala azar the authors conclude that the varying features of the disease are a result of the varying response of the reticulo-endothelial system to the parasitic invasion. The parasite, which is a passive body, is actively phagocyted by the host cell. The cell is incapable of destroying the parasite, which finds the cell a medium suitable for its development. Attention is drawn to the fact that in certain fatal cases of kala azar there appears to be a decrease in the number, or complete disappearance, of the parasite during the last phases. The paper is of the nature of a lengthy philosophic discussion and gives little new information. *C. M. W.*

Guha (Pran Kumar). **Studies in Kala-Azar. With Special Reference to the Liver Function, before and after Treatment with Pentavalent Antimony Compounds (Urea Stibamine).**—*Calcutta Med. Jl.* 1935. Oct. Vol. 30. No. 4. pp. 193–218. [68 refs.]

An investigation of 23 cases of kala azar, 8 of them after treatment with urea-stibamine, has shown that in all the liver function, as judged by the levulose tolerance test, was normal. Urobilinuria was present in all cases. Of the 15 cases examined before treatment 11 showed the van den Bergh reaction to be negative while 4 showed a delayed positive van den Bergh reaction. Of the delayed positive cases one gave a high icterus index and bilirubin content of the blood in the range of latent

jaundice. The icterus index of 11 cases was taken before treatment. In seven of these it was normal while in 4 it was higher than normal and in the range of latent jaundice. There was a tendency for the index to fall during urea-stibamine treatment, which has the general effect of bringing about a return to normal of the other reactions also.

C. M. W.

Lee (C. U.) & Chu (C. F.). **Relative Value of Urea Stibamine and Neostibosan in the Treatment of Kala-Azar.**—*Chinese Med. Jl.* 1935. Apr. Vol. 49. No. 4. pp. 328–339. [18 refs.]

The observations were made at the Peiping Union Medical College. It was found that an adequate course of urea-stibamine for a child was 1·0 to 1·5 gm., as contrasted with 1·5 to 2·5 for neostibosan. For an adult the figures were 1·5 to 2·5 and 4·0 to 5·0. Urea-stibamine is thus definitely more potent than neostibosan which, on the other hand, has the advantage of being a definite chemical compound of a lower toxicity. After treatment with either of these drugs patients must be followed for at least 7 months to a year before cure can be pronounced.

C. M. W.

Martin (R.), Chorine (V.) & Rouessé (G.). Un cas de kala-azar de l'adulte stibio-résistance, splénectomie, guérison. [**A Case of Kala Azar cured by Neostibosan after Splenectomy.**]—*Bull. Soc. Path. Exot.* 1935. May 8. Vol. 28. No. 5. pp. 382–389.

The case described is that of a Russian 21 years of age who contracted kala azar in the south of France. Treatment with neostibosan at first brought about improvement which, however, was not maintained, the case becoming completely antimony resistant. As ground was being lost splenectomy was performed. A good recovery from the operation occurred and after further treatment with neostibosan a cure was effected. A spleen puncture performed 4 days before the operation confirmed the diagnosis of kala azar but was followed by signs of internal haemorrhage which, however, ceased after several hours.

C. M. W.

Naab (J. P.). Ein hartnäckiger Fall von Kala-Azar (Leishmaniosis interna). [**Kala Azar Resistant to Treatment.**]—*Muench. Med. Woch.* 1935. Nov. 1. Vol. 82. No. 44. pp. 1756–1758.

The case described is that of a man 40 years of age who became ill in Istambul a year after going on holiday to Greece and Palestine. The case was very resistant to treatment, though a cure was eventually effected after courses of neostibosan, tartar emetic and fouadin. *C. M. W.*

Ray (J. C.). **Studies on Protozoal Vaccine. Part I. Oriental Sore Vaccine.**—*Indian Jl. Pediatrics.* 1935. Apr. Vol. 2. No. 7. pp. 149–158. With 14 figs. on 4 plates.

In this paper the author gives an account of the treatment of oriental sore with a vaccine prepared from the culture forms of leishmania. The flagellates obtained from the first or second subculture on the surface of a blood agar medium are suspended in phenolized saline to give 20 million flagellates per cubic centimetre. The first dose of

vaccine given subcutaneously is 0·5 cc. for an adult. Other injections are given at intervals of 4–7 days, the dose being increased according to the degree of reaction. The number of injections required varies from 3 to 5 according to the type of case. Of 187 cases treated a cure was effected in 151, while of the remainder 24 showed definite improvement. The duration of treatment varied from 15 to 28 days.

C. M. W.

Kassirsky (I. A.). [**Treatment of Cutaneous Leishmaniasis with *Ricinus* Seeds.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1935. Vol. 4. No. 1–2. [In Russian pp. 67–69. With 2 figs.]

The author describes the treatment of the ulcerating form of oriental sore in Tashkent with an ointment made from the whole seeds of Ricinus, ground up and mixed with 10 per cent. vaseline. The ointment, based on a local remedy, was applied every few days to the ulcer which was either covered with a collodion dressing or bandaged. The first application usually produced considerable irritation and a copious discharge of pus, but as the treatment proceeds, the irritation diminishes and healing may take place after 3 or 4 applications. The active principle is apparently ricin, a toxalbumin which, according to Noguchi, agglutinates red corpuscles and leishmania. The author believes that ricin also stimulates the production of local immune bodies and is toxic to the flagellates and the pyogenic bacteria. The total number of cases successfully treated without leaving any traces was 16, some of which were in a very serious condition owing to various complications and had not responded to treatment by other methods. An attempt to apply the active principle to the treatment of canine visceral leishmaniasis failed for aqueous extracts containing 0·000004 gm. ricin introduced intramuscularly killed the dogs after the first or second injection. *C. A. Hoare.*

THE TYPHUS GROUP OF FEVERS.

MEGAW (John). **Typhus Fevers in the Tropics.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1935. July 31. Vol. 29. No. 2. pp. 105–110.
FLETCHER (William). **Typhus Fevers in Malaya.**—*Ibid.* pp. 111–112.
FELIX (A.). **The Serology of the Typhus Group of Diseases.**—*Ibid.* pp. 113–118. [10 refs.]

A discussion on the subject at a meeting of the Royal Society of Tropical Medicine on the 20th June, 1935.

The discussion was opened by Sir John Megaw who spoke much on the same lines as he had done in opening a similar discussion at the Section of Tropical Diseases of the British Medical Association at Bournemouth in the previous year. Sir John referred to the recent work of ZINSSER who has suggested that Brill's disease in New York is neither flea-borne nor lice-borne typhus but that these cases are recrudescences of the disease originally contracted in Europe; over 90 per cent. of the cases occur in immigrants and the disease does not spread to contacts born in America; some of these people had been more than 20 years in the country before they developed the disease.

Sir John emphasized the fundamental importance from the epidemiological standpoint of the fact that louse-borne typhus is carried from man to man by the louse whereas the other typhus fevers are conveyed from an animal reservoir to man by fleas, ticks or mites and so are non-epidemic, sporadic, place diseases.

Dr. Fletcher, who followed, emphasized some recent advances in our knowledge of this group of fevers. In Malaya when tropical typhus was first discovered in 1924 it was a new disease in that country, but since then the number of cases has increased and the severity of the disease is now much greater, a mortality rate of nil in 1924 has increased to 12 per cent. in 1934.

It has also been shown by LEWTHWAITE that in Malaya there are numerous typhus viruses in the rats of that country, strains of these viruses differ antigenetically not only from one another but also from the human typhus virus.

Dr. Fletcher was of opinion that the most satisfactory method of classification of the typhus group of fevers would be primarily on a serological basis and secondarily by the vector; a serum test can be applied to every case whereas in many cases it is not possible to prove the vector. On the other hand a classification on a serological basis alone is not possible, for example, the diseases due to the virus corresponding to X19 must be divided into flea-borne and louse-borne [and even tick-borne, São Paulo typhus].

Dr. Felix referred to the close correlation between cross immunity and agglutination reactions with various types of *Proteus X*. He illustrated this by means of tables. Dr. Felix did not agree that the typhus group of diseases could be classified according to the vector only; it has been shown that the viruses of louse-borne typhus and flea-borne typhus are antigenetically identical yet their methods of transmission are entirely different; also cases of so-called tick typhus in India belong to a variety of serologically different types of typhus. In conjunction with Colonel Heatley SPENCER, Dr. Felix suggests a classification based on antigenetic types of virus on which immunity and immunity reactions depend. This classification was demonstrated in a table which has already been reproduced in this *Bulletin* [1933, Vol. 30, p. 406].

D. Harvey.

Westra (S. A.). Nieuwere inzichten inzake de groep der vlekty-phusachtige ziekten. [**The Newer Views on the Group of Typhus-like Diseases.**]—*Nederl. Tijdschr. v. Geneesk.* 1935. Oct. 12. Vol. 79. Supp. to No. 41. pp. 4835–4847 (411-423).

Dr. Westra gives a detailed and critical account of the epidemic and endemic typhus group of diseases. His classification reduces them to 3 groupings :—(*a*) Macular typhus in its epidemic and endemic forms, comprising the epidemic typhus of Europe with the body louse as vector and the endemic murine typhus with its rat-flea-man cycle as exemplified by Brill's disease, " shop " typhus and tabardillo. These are characterized by high serum-agglutination of *Proteus X*19 and absence of primary lesion. (*b*) The sub-group of Rocky Mountain fever and its allied affections, such as *fièvre boutonneuse*, with a tick as insect vector, dog or rodent as reservoir and possibly some serum agglutination of both *Proteus X*19 and *XK*. There is evident too in these forms a primary lesion. (*c*) The sub-group of tsutsugamushi, all mite fevers, and characterized by a rat- or mouse-mite-man cycle and strong *Proteus XK* agglutination. Examples of these are the scrub typhus of Malaya, the tsutsugamushi of Japan and the mite-fever of Sumatra and Java.

A correlation appears to exist between the crossed immunity reactions of each disease form, the type of insect vector and the respective agglutination titres obtained with the different *Proteus X* strains. This correlation can scarcely be accidental. It is indeed suggestive of some new relationship between virus and Proteus, whether of a symbiotic nature or perhaps even a genetic, considering the lack of our systematic knowledge of the Rickettsiae.

The author too makes reference to the unitarian views of Felix and Rhodes, who would ascribe all typhus-like diseases to one and the same virus, which should then be regarded in its different manifestations simply as a serological variant.

Epidemic typhus, it is emphasized, has a very special position of its own as being transmitted by a human ectoparasite from man to man ; the occurrence of typhus in man, for all the other forms, is an accidental circumstance only brought about by insect transmission of the virus from a warm blooded animal-reservoir and not at all from man to man. This latter point forms part of the dissertation of Hoesen who followed Westra and contends for the emendation of the Infectious Diseases Law of 1928 to give recognition to the difference in human infectivity of epidemic typhus and the typhus-like diseases. The law makes special provision for procedure in the case of cholera, yellow fever, plague, smallpox and typhus. He would propose :—(1) to substitute for " typhus " the term " typhus diseases " ; (2) to order segregation of the inmates of a dwelling from the patient only if the inspector has not declared in writing that segregation is not, or is no longer, necessary or that it may be replaced by supervision. *W. F. Harvey.*

Harvey (D.). **Typhus Fevers.**—*Jl. Roy. Army Med. Corps.* 1935. July. Vol. 65. No. 1. pp. 1–8.

This review of the subject, amplified and brought up to date, is founded on a similar review written for and published in this *Bulletin* [Vol. 30, pp. 343–49, 406]. *D. H.*

NICOLLE (Charles) & LAIGRET (J). Vaccination contre le typhus exanthématique par le virus typhique vivant, desséché et enrobé. [**Anti-Typhus Vaccination by Living Virus.**]—*C. R. Acad. Sci.* 1935. Aug. 5. Vol. 201. No. 6. pp. 372–374.

The authors recall their suggestion made in 1911 that living virus might be employed as vaccine against true typhus but the method was abandoned as too risky. BLANC has used an attenuated rat typhus virus but in a good many cases fever has resulted after the inoculation. In the present paper the authors attempted to prepare a living vaccine made from a virus of rat typhus recently isolated in Tunis. This vaccine was prepared in the manner already described for yellow fever virus.

The virus employed was made from the brains of infected guineapigs and rats ; the brains were ground up and dried and then enveloped in yolk of egg and suspended in water. The dose for vaccination was 1/200 of a brain. Out of 9 people treated with this vaccine 5 developed fever. It is noted that all 5 were inoculated from the brain of one rat. This method was abandoned and the virus was dried as before, enveloped in yolk of egg and suspended in oil instead of water ; 1st dose of 1/800 to 1/200 of a brain ; second dose 1/400 to 1/100 ; 3rd dose 1/10 and as a test of protection.

One hundred and ten people were treated with this vaccine ; none developed fever and all showed immunity to test dose of rat virus. Also animals treated with this vaccine were found to be immune to a test dose of the historic virus. The authors again insist on the necessity of general lousing as the chief measure of prevention against historic typhus. *D. H.*

SHAHIN (Mohamed). Essai du vaccin antityphique (méthode de Weigl) en Egypte. [**Trial of Anti-Typhus Vaccine (Weigl's Method).**]—*Bull. Office Internat. d'Hyg. Publique.* 1935. Mar. Vol. 27. No. 3. pp. 481–482.

The vaccine (killed emulsion of Rickettsia from infected lice) was obtained from the Institute of Biology in Lwow. As only sufficient to inoculate 200 persons was procured it was decided to inoculate half of the inhabitants of the village of Ezbek and to leave the remainder as controls.

In each household half of the family were inoculated and the other half acted as uninoculated controls. Of 183 persons inoculated only two showed some slight rise of temperature. Two cases of typhus occurred in the village after the inoculations, both in non-inoculated people, none of the inoculated persons in the same households developed fever. *D. H.*

GAUD (M.). Sur la vaccination humaine contre le typhus par la méthode de G. Blanc. [**Vaccination against Typhus by the Method of G. Blanc.**]—*Bull. Office Internat. d'Hyg. Publique.* 1935. Mar. Vol. 27. No. 3. pp. 474–480. With 7 charts.

The murine typhus virus of Casablanca produces only mild fever in man. This virus obtained from the organs of infected guineapigs is diluted with saline and treated with ox bile and while still viable is inoculated into man and produces immunity usually without any appreciable reaction ; nor can the virus be isolated from the peripheral

blood of the inoculated persons. Passage of this virus through guinea-pigs does not exalt the virulence either for men or for experimental animals. Seven hundred and twenty-three men in the jail at Adir were inoculated with the vaccine, which was prepared by Professor Blanc in the laboratory at Casablanca and sent to the jail where it was mixed with the bile just before the inoculations were made.

The infected guineapig was killed in the laboratory at 12 o'clock and the emulsion made and diluted 1/1,000, the vaccine was received at Adir at 2 o'clock and mixed with the bile and the inoculations were all completed by 3 o'clock in the afternoon.

Three hundred and nine men received 1 cc. of the 1/1,000 vaccine and 414 men 2 cc. Slight fever was noted in 5 of the men who received the 1 cc. dose and in 16 of those who received 2 cc. of vaccine.

Forty days later 5 uninoculated controls received 2 cc. of the virus and all reacted. Five men who had received 1 cc. of vaccine were also tested and 2 out of the 5 reacted. Five men who received 2 doses of vaccine were tested and none reacted. *D. H.*

Dimitrijević-Speth (V.). Die Abschwächung des Fleck-typhus-virus durch Gallebehandlung und Immunisierungsversuche mit gallegeschwächtem Hirnvirus. [**The Weakening of Typhus Virus by Treatment with Bile, and Immunity Investigations with Bile-treated Brain-Virus.**]—*Zent. f. Bakt.* I. Abt. Orig. 1935. Apr. 25. Vol. 134. No. 1/2. pp. 67–70. With 1 fig.

The author has repeated the work of Blanc and his co-workers on vaccination with bile-treated typhus virus.

Guineapigs were employed in the work, and various dilutions of bile, 1/10 and 1/20, and undiluted bile were used ; also the virus was exposed to treatment for periods ranging from 5 minutes to 160 minutes. It was found that when bile was mixed in equal parts with emulsion of brain and injected into guineapigs, after 15 minutes' treatment, the incubation period was prolonged and the duration of the fever was less than in controls ; whereas after 30 minutes' exposure to the action of bile there was no fever at all in the inoculated animals, but later these animals reacted to inoculation with virus ; immunity had not been established. Also repeated injections of bile-treated virus did not produce immunity in the guineapigs ; indeed in some of the animals death resulted from the fever produced by the test dose—anaphylaxis is suggested to explain this. *D. H.*

Zia (Samuel H.). **Present Status on Vaccination against Typhus Fever.** —*Chinese Med. Jl.* 1935. July. Vol. 49. No. 7. pp. 679–686. With 2 figs. [22 refs.]

The author refers to the early work of Nicolle on the immunization of persons against typhus by means of minimal doses of living virus from either blood or brain of experimental animals.

Owing to the length of time required to carry out this procedure and especially on account of the risk of producing the fever in the inoculated this method was abandoned. The author then refers to the preparation of vaccines from emulsions of Rickettsia obtained either from lice (Weigl) or from rats and guineapigs (Zinsser & Mooser). These vaccines have been employed on a considerable scale and reports of

their use and the results have been summarized in this *Bulletin* from time to time. [See this *Bulletin*, 1933, Vol. 30, pp. 400, 887; 1934, Vol. 31, p. 248.] *D. H.*

Bustamante (Miguel), Varela (Gerardo) & Ríos Neri (Fernando). Profilaxis del tifo por medio de suero. [**Prophylactic Serum in Endemic Typhus.**]—*Bol. Oficina Sanitaria Panamericana.* 1935. June. Vol. 14. No. 6. pp. 511–518. With 4 figs.

An outbreak of endemic typhus (Mexican type) occurred in 1934 in San José del Pacifico in the State of Oaxaca and in the first 7 months there were 166 cases 26 deaths and in the last three months the increase was marked, cases numbering 25, 40 and 70 and deaths 2, 5 and 12 respectively. A serum was prepared by daily peritoneal inoculations of white rats with rickettsia emulsion obtained from an infected animal. The peritoneal cavity was then washed out and the fluid, which contained abundant rickettsia, was injected into a horse for production of antiserum. Altogether 169 patients [in another place the numbers total 166] were injected, 20 of them on two occasions with 5 cc. of the serum. Three among those inoculated contracted the disease within 15 days, but 7 among 39 not inoculated. Among the 20 reinoculated 3 were attacked within 30 days, none after that interval. Of the total 169, 13 or 7·6 per cent. were attacked within 60 days, but none died, whereas of 39 not injected 9 were attacked and 6 died. The authors conclude that the serum prepared with the Mooser strain of Mexican endemic typhus, " a strain with murine characters," is active prophylactically and in modifying the severity of the attack in outbreaks, and adds further proof that the endemic and epidemic typhus in this part of the world is of murine origin. *H. H. S.*

Ciuca (M.), Balteanu (J.) & Constantinesco (N.). La maladie inapparente comme réservoir humain de typhus exanthématique. Son importance épidémiologique. [**The Epidemiological Importance of Inapparent Typhus Fever.**]—*Arch. Roumaines Path. Expérim. et Microbiol.* Paris. 1935. Mar. Vol. 8. No. 1. pp. 99–110. With 7 figs. [19 refs.]

An outbreak of typhus occurred among a group of 20 agricultural workers who were crowded together in one small hut; of these 6 were sent to hospital with typhus.

The 14 contacts were cleansed, loused and rehoused; all of these remained healthy. The Weil-Felix reaction was tested and out of the 14, 8 gave a positive reaction, 6 were negative. Blood from each of the 8 men who gave positive reactions was inoculated into guineapigs and all reacted; these viruses were passaged and studied. Emulsion of the brain of a guineapig infected with this virus was inoculated into a patient with G.P.I. but produced no reaction. Blood taken from this patient and inoculated into a guineapig produced a typical typhus reaction and was passaged to rats and guineapigs; from these guineapigs another patient was inoculated and he developed a very definite 14-days' fever but without rash or other symptoms of typhus. Some 3 months later these two men were tested by the inoculation (accidentally) of virulent typhus blood; the man who had the inapparent infection developed fever and recovered, the other man who had had a definite fever did not react in any way; apparently the inapparent

infection had not developed immunity, whereas the definite attack of fever although without other symptoms had produced a solid immunity.

The virus disappeared from the blood of the contacts in from 10 to 15 days. Although these 8 men did not develop definite attacks of typhus yet they were reservoirs of the virus, and such contacts are a danger and may account for sudden outbreaks of the disease and for its endemicity. It is obvious that the occurrence of these inapparent infections is another argument for universal lousing of a population and not only of the actual cases of the disease. *D. H.*

Lorando (N.). Sur quelques cas de typhus endémique (maladie de Brill) à Athènes. [**On Some Cases of Endemic Typhus in Athens.**] —*Rev. Méd. et Hyg. Trop.* 1935. Jan.–Feb. Vol. 27. No. 1. pp. 23–30. [14 refs.]

Boutonneuse fever has already been met with in Athens but the two cases here described could be clearly differentiated as typhus by reason of the distribution of the rash and the marked nervous symptoms. Also the Weil-Felix reaction was strongly positive for *Proteus X19* and the virus was readily transmitted to guineapigs by injection of 2 cc. of blood from the patients and gave rise to typical symptoms of endemic typhus in the guineapigs.

Rats were numerous in and about the houses in which the cases occurred. Some of these were captured and killed and the typhus virus was isolated from them. *D. H.*

Stott (H.). **The Immunological Problems of the Typhus Fever Group as raised by a Sporadic Case of Typhus (Vector Unknown) from Hamirpur in the Plains of India with a Note on the History of Tick Typhus in India.**—*Indian Med. Gaz.* 1935. June. Vol. 70. No. 6. pp. 335–342. [11 refs.]

This paper commences if one might say so with an anticlimax ; the author in the introductory paragraphs refers to two previous cases of " tick typhus " investigated at the Medical College Hospital in Lucknow and goes on to say that the present paper is concerned with the investigation of the third case of tick typhus in the same institution, but on turning over a page one finds the following sentence : " This third case is described here as tick typhus, but in fact the vector was unrecognized. A more accurate scientific diagnosis would be a case of sporadic typhus due to an unknown vector." [The same remark would apply to the two previous cases.]

The author goes on to refer to the work of McKechnie who first recognized that a mild sporadic form of typhus existed in the Kumaon Hills in India and that this disease was not louse borne. McKechnie's observations were not published in the journals but appeared in official publications in India and were brought to light by Megaw, who himself contracted the disease in Kumaon and attributed it to a tick bite.

Similar mild forms of typhus had already been described in North Africa (Connor & Bruch) and in South Africa (McNaught) in 1910 and it had been suggested that these diseases might be due to tick bite although this was not scientifically proved until 1928 so far as these diseases are concerned.

The case under discussion in this paper was that of a missionary who had been camping in the Hamirpur district of Jhansi (where one of the two previous cases had also occurred) and he had undoubtedly been exposed to risk of tick bite. Clinically the case was typical of one of the typhus group of fevers, and showed a profuse roseolar maculo-papular rash with dusky subcuticular mottling on the body, limbs, face, feet, and hands; a few small petechiae were also noted; muscular and joint pains in the limbs and back were severe and insomnia was a marked feature. Mentally there was no toxaemic dulling nor even headache. The fever lasted 21 days and the rash faded slowly and brown staining of the skin remained for many days. The author states that the clinical diagnosis of "tick typhus" was clear [but which form of tick typhus is meant? Rocky Mountain fever, São Paulo typhus, boutonneuse fever and South African tick bite fever are all forms of "tick typhus" but all differ clinically from one another]. The differential diagnosis is very carefully gone into, dengue, measles, cerebro-spinal fever, louse-borne typhus, mite typhus and typhoid fever are all considered and excluded.

The third section of the paper gives an account of very careful serological investigations which revealed the interesting fact that the serum of this patient gave (1) a positive Wassermann reaction, which appeared early in the disease and again became negative 7 days after the fever had ceased; (2) a positive Widal reaction or at least a sympathetic rise of the inoculation agglutinins for *Bact. typhosum*; (3) a positive Weil-Felix reaction for *Proteus X19* up to a dilution of 1/25,000; this is not usual for other forms of "tick typhus" although as the author points out it has been met with in other cases of sporadic typhus in India. *D. H.*

RAGIOT (Ch.) & DELBOVE (P.). Typhus endémique de Cochinchine. [**Endemic Typhus Fever in Cochin China.**]—*Far Eastern Assoc. Trop. Med. Trans. Ninth Congress, Nanking, China, 1934.* Vol. 2. pp. 471–479.

During the years 1933–1934 several cases of mild endemic typhus with a positive Weil-Felix reaction have been recorded in Saigon; other cases which were clinically the same but in which the Weil-Felix reaction was negative were also met with. A full clinical description of these cases is given; this does not differ from similar cases met with elsewhere as regards the rash, etc., but lung complications were common and "may dominate the clinical picture."

Three types of case are described in detail:—

1. Pneumonic case, with positive Weil-Felix reaction with *Proteus X19*. 2. Endemic typhus type of case; Weil-Felix reaction positive with *Proteus XK*. 3. Endemic typhus type of case; Weil-Felix reaction negative. In none of these cases was a primary sore (tache noire) noted. The authors state that in Cochin China the disease differs clinically from epidemic typhus, Japanese River fever and boutonneuse fever, but resembles tabardillo, tropical typhus of Malay and especially the ship typhus of Toulon.

A virus was isolated from the blood of a patient and gave all the characteristics of a murine typhus virus; it has, however, not yet been possible to carry out cross-immunity tests. Lice were not found on any of the patients and there were no instances of cross-infection when cases were treated in general wards in hospitals. *D. H.*

Ragiot (Ch.) & Delbove (P.). Typhus endémique et typhus tropical en Cochinchine. [**Endemic Typhus and Tropical Typhus in Cochin China.**]—*Bull. Soc. Path. Exot.* 1935. Mar. 13. Vol. 28. No. 3. pp. 163–167.

Cases of endemic typhus in which the Weil-Felix reaction was positive to *Proteus X19* and negative to *Proteus XK* have been recently reported from Cochin China. Three cases are reported in this paper in which the clinical symptoms were similar to the above (no primary sore) but the Weil-Felix reaction was positive for *Proteus XK* and negative for *Proteus X19*. A virus isolated from these cases gave the characteristics of a tsutsugamushi virus or scrub typhus of Malaya ; one of these cases occurred in a child in a town and not on the plantations. *D. H.*

Hermant. Au sujet du typhus exanthématique en Indochine. [**Typhus in Indo-China.**]—*Bull. Office Internat. d'Hyg. Publique.* 1935. Mar. Vol. 27. No. 3. pp. 483–484.

An historical survey of the subject. The papers referred to have already been summarized in the *Bulletin.* *D. H.*

Priest (R.). **A Fever of the Typhus-Group amongst the British Troops in Egypt.**—*Jl. Roy. Army Med. Corps.* 1935. July. Vol. 65. No. 1. pp. 9–14. With 1 chart.

An isolated case of typhus fever is described. Fever lasted for 15 days with a profuse roseolar rash on the body and limbs, soles of the feet and palms of the hands ; the Widal reaction was negative but it was noted that there was a sympathetic rise of the inoculation agglutinins in the blood ; blood culture was negative ; the serum taken on the 15th day of the disease gave a positive Weil-Felix reaction in a dilution of 1/1,250 with *Proteus X19*, negative to *Proteus XK*.

The patient remained in a drowsy condition throughout the fever ; no primary sore or tache noire was detected and no lice were found on the patient or on his clothing.

There were no other cases in the barracks before or since. The case is argued from the clinical and epidemiological aspects and it is decided that this was a case of rat- rat-flea- man infection similar to cases reported in Toulon and other Mediterranean seaports.

D. H.

Lasnet. Le typhus exanthématique en Algérie. [**Typhus in Algeria.**] —*Bull. Office Internat. d'Hyg. Publique.* 1935. Aug. Vol. 27. No. 8. pp. 1546–1553.

Typhus fever occurs every year in Algeria and specially in the winter, it is louse-borne typhus.

There are certain centres of the disease where it seems to smoulder along and every year epidemics start from these centres, which are in the poorest parts of Algeria and epidemics occur if for any reason the economic condition of the people is lowered, for instance by drought and resulting famine. In good years there may be few or no cases, in bad years there may be many. Lice are always prevalent especially in the winter.

Nowadays the disease is spread from these centres by people travelling ; especially is this the case at religious ceremonies and on journeys to sacred shrines.

Prevention.—The first necessity is the discovery of the cases and notification of them. The second isolation of the patients. The third lousing of the patients and all contacts. If cases are few this may be done by the local medical authorities, but in the event of an epidemic, equipment and personnel is sent out from headquarters ; the method of choice for lousing clothing and bedding is by sulphur fumigation ; owing to the extreme scarcity of water in many localities steam is not available in sufficient quantity. Lousing stations are now established in these endemic centres. No explanation is given for the carry over of the infection from one epidemic season to another but it is suggested that mild or inapparent cases occur during the summer. *D. H.*

Moreira (João Affonso) & de Magalhães (Octavio). Typho exanthematico em Minas Geraes. [**Exanthematic Typhus in Minas Geraes.**]—*Brasil-Medico.* 1935. May 25. Vol. 49. No. 21. pp. 465–470. With 3 charts.

This is a record of experimental work on the transmission by the larval or adult forms of *Amblyomma cajennense* and of *Ctenocephalus felis* of the virus of typhus fever to a number of animals—dog, fox, teguexin [*Tupinambis teguexin*, a lizard-like creature], armadillo, opossum, chameleon, camondongo [Brazilian house-rat], brown and grey rats and the hare. The second and possibly others of these can be infected, but the opossum is the only natural reservoir of the virus.

H. H. S.

Piza (José de Toledo). Importance de la tique dans la dissémination du typhus exanthématique de Sao Paulo. [**The Tick as a Transmitter of São Paulo Typhus.**]—*C. R. Soc. Biol.* 1935. Vol. 119. No. 22. pp. 751–753.

The author refers to the work of Monteiro and others who have shown that the virus of São Paulo typhus can be carried to experimental animals by the tick *Amblyomma cajennense.* He describes the case of a lady who had a tick removed from the shoulder ; a primary ulcer formed at the site of the tick bite, and 4 days later this lady developed a severe attack of typhus fever with profuse rash and severe muscular pains.

A second similar case is described, the patient dying on the 13th day after the bite of the tick ; the incubation period in this case was only 24 hours.

The suggestion that lice may also carry the virus is discussed but the author does not consider that lice are carriers of the disease for several reasons, (*a*) the disease is not directly contagious and is sporadic, and (*b*) it is a disease of rural surroundings. *D. H.*

Bernales (Juan Voto) & Bambarén (Carlos A.). Segundo caso autóctono de fiebre exantemática observado en Lima. [**Another Indigenous Case of Typhus in Lima.**]—*Crónica Méd.* Lima. 1934. Dec. Vol. 51. No. 858. pp. 482–489.

This is the second case of " exanthematic fever " recorded as occurring in Lima. The patient was a man of 48 years and the disease

was severe, death taking place on the fourth day after his coming to hospital. The Weil-Felix reaction was negative, but clinically the symptoms were typical. The murine type is known to occur in Lima and the author concludes [on unstated grounds] that the infection was conveyed by rat fleas. *H. H. S.*

Langan (A. M.) & Mathew (R. Y.). **The Establishment of "Mossman," "Coastal" and Other Previously Unclassified Fevers of North Queensland as Endemic Typhus.**—*Med. Jl. Australia.* 1935. Aug. 3. 22nd Year. Vol. 2. No. 5. pp. 145–148. With 2 figs.

In June 1935 a number of cases of so-called Mossman fever occurred in this district and in Cairns and Tully. It has already been suggested that these fevers really belong to the group of typhus-like fevers. Several of these cases were studied by the authors and they note the extraordinary diversity of clinical type. For instance the fever may be long or short; lymphatic glands are enlarged in some cases not in others; some show nervous involvement others do not. In 8 cases observed two showed profuse typical rash, two showed no rash at all, four had slight and evanescent rash.

Weil-Felix reaction.—Of 8 cases tested one gave a positive reaction with X19 and 7 gave a positive reaction with XK. All these showed a rise of titre during the fever and early convalescence. The author considers that the failure to obtain a positive result in previous cases was due partly to the use of unreliable cultures and to the testing of the serum early in the fever and not repeating the test later on.

D. H.

Gunther (Carl E. M.). **Endemic Typhus in New Guinea.**—*Med. Jl. Australia.* 1935. June 29. 22nd Year. Vol. 1. No. 26. pp. 813–814.

Two cases of endemic typhus are described.

These two men in the course of their work, or rather on their way to work, had to pass through freshly felled bush where they were exposed to the bite of the "bush mokka" (mite) as it is known by the people locally. A primary sore was noted in each case and the fever lasted about 2 weeks with fever headache and profuse rash. The serum of one of the patients agglutinated *Proteus XK* up to a dilution of 1/160, but not *Proteus X19*; the other case was not tested.

D. H.

Plazy (L.) & Germain (A.). D'une modalité rare de la courbe thermique dans le typhus murin. [**A Rare Type of Temperature Curve in Endemic Typhus.**]—*Bull. Soc. Path. Exot.* 1935. Mar. 13. Vol. 28. No. 3. pp. 161–162. With 2 charts.

The fever in these cases was either remittent or intermittent, the Weil-Felix reaction was positive and a typical rash was noted. There were no rigors and no malarial parasites could be found. [The charts given recall those of cases of trench fever.] *D. H.*

KODAMA (Makoto). Zusammenfassender Bericht ueber die Ergebnisse der experimentellen Fleckfieberforschung in Japan. [**A Summary of the Reports of Results of Typhus Fever Research in Japan.**]—*Zent. f. Bakt.* I. Abt. Ref. 1935. July 4. Vol. 118. No. 5/6. pp. 97–103. [27 refs.]

The majority of the papers referred to have already been summarized in the *Bulletin.*

The Manchurian endemic typhus is compared with Mexican typhus and it is agreed that clinically and epidemiologically they are similar; experimental work on animals also gives like results in the two countries. *D. H.*

GOODMAN (Charles) & BRODIE (Maurice). **A Skin Test indicating a Previous Typhus Infection.**—*Proc. Soc. Experim. Biol. & Med.* 1935. May. Vol. 32. No. 8. pp. 1332–1334.

Twelve men who had had typhus from 1 to 8 years previously were given an intracutaneous injection of 0·1 to 0·2 cc. of a formalized Rickettsia suspension prepared from the tunica of infected guineapigs; all 12 showed an erythematous indurated area of 1 cm. to 4 cm. in diameter at the site of injection. Ten healthy adults who had not had typhus were similarly inoculated, none of these showed any reaction. *D. H.*

GOODMAN (Charles). **A Skin Test to suggest the Diagnosis of Recovered Typhus and Thrombo-Angiitis.**—*Bull. New York Acad. Med.* 1935. June. 2nd Ser. Vol. 11. No. 6. pp. 403–412.

The author traces a connexion between typhus fever and thrombo-angiitis obliterans, indeed he considers that this condition is a late manifestation of typhus fever.

In order to get support for his suggestion he employed a sensitivity test using a formolized emulsion of Rickettsia which was injected intracutaneously.

Eleven people who had had typhus were tested, all gave a positive reaction and 17 people who had suffered from thrombo-angiitis also gave a positive reaction; whereas 18 controls were all negative.

A discussion followed and it was pointed out that there were hundreds of cases of thrombo-angiitis in America which gave no history whatever of typhus; but the author is inclined to the opinion that this disease is due to the typhus virus and may cause the condition without any other symptom. *D. H.*

GIROUD (Paul) & PLOTZ (Harry). Immunité croisée entre les cultures de typhus exanthématique historique ou murin et les virus de passage. [**Cross Immunity between the Cultures of Historical and Murine Typhus and the Passage Virus.**]—*C. R. Acad. Sci.* 1935. Apr. 1. Vol. 200. No. 14. pp. 1255–1256.

The cultures employed were those of a Mexican murine virus and a European classical or historical virus. The strains of virus in passage were one Mexican rat virus and one Tunis rat virus and an historical virus.

The guineapigs inoculated with the culture of true typhus virus and tested 3 months later were protected 11 times out of 16 against

the passage virus. The murine culture protected 13 times out of 15 against the passage virus.

The interesting point noted is that the infection produced by the cultures protected the guineapigs against the virus of passage better than the infection produced by the passage virus protected against the culture. *D. H.*

Giroud (Paul) & Plotz (Harry). Étude expérimentale des infections, déterminées par les cultures des virus typhiques historique ou murin, et des immunités qu'elles déterminent vis-à-vis de ces virus ou de leurs cultures. [**Experimental Study of the Infections produced by Cultures of Historic Typhus or Rat Typhus and the Immunity produced against these Viruses or the Cultures.**]—*Arch. Inst. Pasteur de Tunis.* 1935. June. Vol. 24. Nos. 3 & 4. pp. 420–434. With 8 charts.

Tissue cultures of Rickettsia were prepared and studied as regards (1) infectivity for animals; (2) production of immunity.

The strains used in culture were: (1) Mexican rat virus, (2) European historic virus. Strains of passage viruses were: (1) Human virus of Tunis, (2) Mexican rat virus, (3) Tunis rat virus.

The medium in which the cultures were made consisted of Tyrode's solution 2 parts, guineapig serum (normal) 1 part, and fragments of normal tunica tissue cells. The inoculum was either infected tissue cells or brain tissue. These cultures were incubated at 37°C. for 10 days; subcultures were made from tissue débris of previous culture mixed with fresh normal tunica tissue. The European virus was subcultured 10 to 17 times and the Mexican virus 70 times. These cultures stained with Laveran-Borrel blue showed typical Rickettsia.

Inoculation of cultures of the human virus taken on the 10th day gave a typical fever in guineapigs without orchitis and when tested later these animals were immune to further inoculations of culture and virus.

Immunity reactions.—(1) Guineapigs inoculated with above cultures were protected 11 times out of 16 against the various passage viruses. (2) Guineapigs inoculated with the various passage viruses were protected 4 times out of 16 against the cultures of historic virus.

Inoculation of cultures of the Mexican rat virus produced fever in guineapigs and orchitis similar to that produced by inoculation of passage virus and gave immunity to further doses.

Immunity reactions.—(1) Guineapigs inoculated with the cultures of Mexican virus were protected 13 times out of 15 against inoculation of the passage viruses. (2) Guineapigs inoculated with the passage viruses were protected 3 times out of 14 against cultures of Mexican virus. These results are explained by the fact that the dose of Rickettsia or virus is much greater in the culture than in the blood of an infected animal or even in the brain. *D. H.*

Giroud (Paul). Action sur le virus historique de Tunis du sérum antityphique murin de Zinsser. [**The Action of the Anti-Typhus Serum of Zinsser on the Historic Virus of Tunis.**]—*Arch. Inst. Pasteur de Tunis.* 1935. June. Vol. 24. Nos. 3 & 4. pp. 475–479. With 2 figs.

Guineapigs were employed in this research. These animals were inoculated with virulent blood from other guineapigs and 2 cc. of the

serum were given 2 hours, 24 hours, and 48 hours after the infecting dose. It was found that there was evidence of imperfect protection ; but if 3 doses were given the animals were protected against small doses of virus, *i.e.* guineapig brain. *D. H.*

Prica (Milan). Die Ratten als Träger des Fleckfiebervirus in Zagreb (Jugoslawien). [**Rats as Carriers of Typhus Virus in Zagreb.**]—*Zent. f. Bakt.* I. Abt. Orig. 1935. Apr. 25. Vol. 134. No. 1/2. pp. 63–67. [10 refs.]

Sixty-nine wild rats were captured in Zagreb and killed and the pooled blood was inoculated into guineapigs ; a positive result was obtained on three occasions. From 30 white rats in the laboratory a positive result was obtained on one occasion. Twenty out of 75 wild rats gave a positive Weil-Felix reaction (26·6 per cent.) whereas 18 out of 30 white rats gave a positive reaction (60 per cent.). The author suggests that the higher rate of infection among the white rats in the laboratory is due to the fact that they were crowded together in cages. *D. H.*

Nicolle (Charles) & Sparrow (Hélène). Le faible pouvoir pathogène pour les petits singes du virus murin I des rats du port de Tunis, inoculé par les voies péritonéale, sous-cutanée et conjonctivale. [**The Feeble Pathogenicity for Small Monkeys of Rat Virus No. 1 of Tunis, inoculated by the Peritoneal Subconjunctival or Subcutaneous Route.**]—*Arch. Inst. Pasteur de Tunis.* 1935. June. Vol. 24. Nos. 3 & 4. pp. 461–474.

It is well known that monkeys are as a rule very susceptible to typhus virus both rat and human ; but it was found that this was not so with the No. 1 rat virus of Tunis. Six monkeys were inoculated intraperitoneally with this virus, only one had fever but all six gave a positive Weil-Felix reaction and were proved to be immune to typhus. The virus was even less potent when given by the conjunctival route and failed altogether to infect rats by this route [see following abstract]. *D. H.*

Nicolle (Charles) & Sparrow (Hélène). Infection par voie conjonctivale des petits singes avec le virus typhique murin I des rats de Tunis. [**Infection of Monkeys by the Virus I of Rat Typhus viâ the Conjunctiva.**]—*C. R. Acad. Sci.* 1935. May 20. Vol. 200. Nos. 21. pp. 1702–1704.

The virus of epidemic typhus is frequently pathogenic by the conjunctival route. Lice faeces or the crushed bodies of lice may contaminate the fingers of workers and if the eye is rubbed infection follows ; several accidents in the laboratory have occurred in this way. The authors have shown that their No. 1 rat virus of Tunis is only feebly pathogenic for monkeys. The experiments recorded in this paper show that infection may be produced in monkeys if this virus is inoculated into the conjunctiva. Emulsion was made of the brain of rats and instilled into the eye, one drop at a time at half-hour intervals, 4, 5 and 8 drops. Of six monkeys tested none showed any fever but two gave a positive Weil-Felix reaction and when tested later were found to be immune to the epidemic typhus virus.

D. H.

Sparrow (Hélène). Etude d'un nouveau virus typhique murin, isolé d'un rat de la ville de Tunis. [**A New Strain of Rat Typhus Virus isolated in Tunis.**]—*Arch. Inst. Pasteur de Tunis.* 1935. Apr. Vol. 24. No. 2. pp. 218–253. With 12 charts.

This strain of virus was isolated from a rat captured in a house in the town of Tunis some distance from the port where previous strains already described had been isolated. There had been no case of typhus in this house for many years. In 25 guineapigs in which this virus was passaged fever resulted in all but two. As regards orchitis this was not seen till after the 6th passage and was regularly seen after the 21st passage. There was crossed immunity of this virus with other murine typhus viruses and with the epidemic or human virus.

Rats.—Of 49 used all showed fever except one. Fifty per cent. of the rats gave a positive Weil-Felix reaction. *D. H.*

Sparrow (Hélène). Enquête sur la présence du virus typhique chez les souris de Tunis. [**Search for Typhus Virus in the Wild Mice of Tunis.**]—*Arch. Inst. Pasteur de Tunis.* 1935. June. Vol. 24. Nos. 3 & 4. pp. 435–460. With 6 charts.

Three hundred mice were examined.

The brains were removed and kept in a frigidaire and tested for bacterial sterility. Lots of 2, 4 and 6 brains were emulsified and inoculated in doses of 1 to 2 cc. into rats and guineapigs. Two strains of virus were isolated from the mice.

These viruses were very carefully studied and were passaged in rats and guineapigs; the protocols of the experiment are given in full; crossed immunity experiments were carried out and showed the identity of the mouse virus with the virus No. 1 originally isolated from rats in the Port of Tunis; there was also immunity against epidemic virus but not so complete. None of the sera of mice tested gave a positive Weil-Felix reaction. Of 18 guineapigs inoculated with the mouse virus 13 developed orchitis. Rats inoculated with the virus had fever and a positive Weil-Felix reaction was observed, rabbits inoculated with the virus had an inapparent infection with a positive Weil-Felix reaction. *D. H.*

Giroud (P.) & Haber (P.). Non adaptation du virus typhique historique à la souris blanche après électropyrexie par ondes courtes. [**Disappearance of Typhus Virus in White Mice after Treatment by Short Wave Electrotherapy.**]—*C. R. Soc. Biol.* 1935. Vol. 119. No. 17. pp. 135–136.

In previous work on the same lines the author has shown that the effect of electrotherapy on infected guineapigs is to prolong the period during which the virus remains viable in these animals. It is suggested that this is due to the action on the tissues causing a reduction, or preventing the production of antibodies. Similar work with white mice is recorded in the present paper and it was found that the electrical treatment had the effect of destroying the virus and it was not possible to passage the virus in treated white mice. *D. H.*

Donatien (A.) & Lestoquard (F.). Existence en Algérie d'une *Rickettsia* du chien. [**Rickettsia in Dogs in Algeria.**]—*Bull. Soc. Path. Exot.* 1935. June 12. Vol. 28. No. 6. pp. 418–419.

Dogs in the neighbourhood of the laboratory were found to be heavily infested with ticks (*Rhipicephalus sanguineus*); of 5 infested dogs 4 died. Examination of smears made from the walls of the large arteries revealed numerous typical Rickettsia in the monocytes; these organisms were also found in cells of the peripheral blood taken just before death.

Monkeys were inoculated with material from the dogs and they developed fever and Rickettsia were found in the blood of these animals also. [The author seems inclined to regard this as a special strain of Rickettsia, for which be proposes the name *R. canis*.] *D. H.*

Lépine (P.) & Lorando (N.). Le typhus exanthématique du chat. [**The Virus of Typhus in a Cat.**]—*Bull. Soc. Path. Exot.* 1935. May 8. Vol. 28. No. 5. pp. 356–360.

During an investigation of an outbreak of endemic typhus in Athens one case was noted in a house in a street where several cases had occurred; on the bed of the patient a large black and white cat was sleeping. This cat was removed to the laboratory and killed and examined, an emulsion of the brain was inoculated into guineapigs and a typical murine typhus virus was isolated and passaged. This virus protected guineapigs against other typhus viruses both murine and human. Seventeen fleas [not named] were collected from the cat, emulsified and injected into guineapigs and a similar virus was obtained from these.

As there were no other cases in contact with this man and there were no rats in the house it is considered that he became infected from the cat. Eight other cats were examined all from the endemic area and only one of these was found to be infected. Experimental work was carried out with cats and it was found that cats are not readily susceptible and the virus does not persist in them for any length of time. Cats can be infected by the intestinal route if fed on spleen of infected guineapigs. *D. H.*

Tamura (Shogoro). Vergleichungen der biologischen und immunologischen Eigenschaften jedes Stammes von Weil-Felix'schem Proteus-X. [**A Comparison of the Biological and Immunological Characters of Certain Strains of Proteus X.**]—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1935. June. No. 6 (363). [In Japanese pp. 757–804. With 5 figs. on 1 plate. German summary pp. 805–806.]

Three strains of Proteus, namely XK, X19 and X2 were obtained and the O and H varieties of each were compared and contrasted as regards the cultural properties, heat resistance and serological reactions. The sera of persons suffering from diseases other than typhus were also tested and it was found that the sera of some syphilitic patients agglutinated Proteus cultures in fairly high dilution.

D. H.

PARKER (R. R.). **Rocky Mountain Spotted Fever : Results of Ten Years' Prophylactic Vaccination.**—*Jl. Infect. Dis.* 1935. July–Aug. Vol. 57. No. 1. pp. 78–93. With 1 fig.

The method of preparation of this vaccine has already been fully described in previous papers. It is made by emulsifying the tissues of virus laden adult wood ticks in formol phenol saline. Five hundred ticks are emulsified at a time and make some 400 cc. of vaccine. Each batch of vaccine has to be standardized by protection tests with guineapigs and the dose estimated ; usually 1 cc. for children and 2 cc. for adults.

This vaccine was first used in 1925 as a prophylactic and in this paper the results of 10 years' trial are recorded.

At first only 10 litres of vaccine could be manufactured in a year but over 200 litres were prepared last year. In early days two test areas were selected, one in Montana where the cases were few but the case mortality high ; the other in Idaho where cases were more numerous and the mortality much lower. The results of the first four years' trial in these two districts were collected and studied and it was decided :—

1. That the vaccine had definite value for prevention.
2. In Montana with the virulent type of the disease the vaccinated had milder attacks and recovered, the unvaccinated died.
3. In Idaho against the mild type of the disease there was full protection in the vaccinated.

In the 10 years up to 1934, 150,000 people have been vaccinated and of these 64 have developed the fever, 45 of these in the same season in which they were vaccinated.

In the Bitterroot valley, Montana, the mortality in unvaccinated adults was 82 per cent. whereas the mortality among vaccinated adults was only 6·6 per cent.

There have been 22 cases of infection among the workers in the laboratory dealing with the Bitterroot virus. Seven of these were not vaccinated and all died, 15 were vaccinated and only one of these died.

As regards Idaho where the mortality is low, in 193 vaccinated shepherds frequently exposed to infection only one case occurred, whereas there were 22 cases among 364 controls similarly employed.

It may be said generally that the vaccine confers immunity against the mild virus and reduces the severity of the disease with the highly virulent strains. There is some evidence that the immunity extends into the second season after vaccination. *D. H.*

MAILLARD (E. R.) & HAZEN (E. L.). **Rocky Mountain Spotted Fever in New York State outside of New York City.**—*Amer. Jl. Public Health.* 1935. Sept. Vol. 25. No. 9. pp. 1015–1017. [Abstract by the authors.]

A brief summary is presented of ten cases showing clinical evidence of Rocky Mountain spotted fever which have occurred in New York State (outside of New York City) from 1926 to 1934, as well as the results of the agglutination tests performed with *Proteus X19* with blood specimens from the patients.

In nine cases there was either clinical evidence of tick bite or a definite history of contact with ticks before the onset of illness. None of the cases could be associated with flea bites. The distribution and

character of the rash in the majority of the cases were strikingly similar, appearing early on the extremities, later becoming generalized.

An agglutination reaction was demonstrated with *Proteus X19* and the blood sera from eight of the ten patients, and partial agglutination was obtained with two of the sera.

NICOLLE (Charles) & SPARROW (Hélène). Quelques expériences pratiquées avec le virus de la fièvre fluviale du Japon (Tsutsugamushi). [**Experiments with the Virus of Japanese River Fever.**] —*Arch. Inst. Pasteur de Tunis.* 1935. Apr. Vol. 24. No. 2. pp. 179–217. With 16 charts.

Two strains of the virus of Japanese River fever were sent to Tunis by Professor NAGAYO, only one of these strains, however, survived the journey and it is this strain, Chiba, which was employed by Professor Nicolle in the work described in this paper.

The virus arrived in a rat, after 4 passages on board ship on the way from Japan, and the blood of this rat proved infective for a monkey when inoculated into and under the skin. Forty-six monkeys in all were inoculated mostly as " indicators " of infection as these animals all reacted with fever whereas rats, rabbits and guineapigs had inapparent infections as a rule.

Of 12 monkeys which were inoculated with equal doses of virus full details are given ; 11 reacted with fever, the incubation period was from 4 to 11 days and the duration of the fever varied from 2 to 11 days. No local lesion was noted in any of the monkeys although the virus was inoculated into and under the skin. The Weil-Felix reaction, which was tested in all cases, usually became positive after the fever had ceased, and although *Proteus OX19* was agglutinated *Proteus OXK* was agglutinated in higher dilution. The former was agglutinated to a dilution of 1/160 in 3 cases, whereas the latter was agglutinated to 1/160 four times, to 1/320 three times, 1/640 once and to 1/1,200 twice.

It is interesting that the blood of monkeys reacts somewhat in the same manner as that of human beings whereas, as will be shown later, the blood of infected rats did not agglutinate *Proteus OX19* but agglutinated *Proteus OXK*.

Rats.—The authors found that with the strain Chiba rats showed only an inapparent infection, the only signs of infection being that if the rats were killed from the 9th to 14th day after inoculation the organs were infective for monkeys and these animals developed fever. Also the Weil-Felix reaction of the serum of the rats became positive for *Proteus OXK* but not for *Proteus OX19*. Of 18 rats examined 16 gave a positive reaction for *Proteus OXK*. The blood of rats when inoculated into the anterior chamber of the eye of rabbits did not produce the typical reaction described by Japanese workers. Nicolle considers that this was due to loss of virulence of the virus in rats. On the other hand blood of infected monkeys produced this typical reaction in the eye of rabbits. The blood of infected rats injected intrarectally in lice was followed by multiplication of Rickettsia in these insects.

Guineapigs.—Infection was usually inapparent but several animals had attacks of fever after incubation periods of 2 to 3 weeks. As regards the Weil-Felix reaction in these animals it is pointed out that the sera of guineapigs, whether infected or not, do not agglutinate

Proteus OX19 whereas that of normal guineapigs agglutinates *Proteus OXK*.

Crossed immunity experiments were carried out and it was found that river fever virus protected against itself, but not against typhus, nor did typhus virus protect against river virus. Extensive experiments were carried out with fleas and lice which were fed on infected animals. It was found that river virus remains active in lice for 7 days after the infected feed, but cannot be conveyed by their bite. The virus remains active in fleas for 11 days and *can* be conveyed by their bite. *D. H.*

Wolff (J. W.) & Kouwenaar (W.). Onderzoekingen over de Sumatraansche mijtekoorts. IX. Ooginfecties bij konijnen. [**Sumatra Mite Fever. Eye Infection in Rabbits.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1935. May 14. Vol. 75. No. 10. pp. 805–810. With 5 figs. on 1 plate. English summary (10 lines).

The work of Nagayo and others on the eye lesions obtained by injection of the virus of tsutsugamushi disease is recalled, and a description is given of the macroscopic and microscopic appearances produced. Soon after the publication of the Japanese work the authors proceeded to test the mite fever virus of Sumatra in the same way, but have obtained much less constantly positive results than the Japanese investigators. Albino rabbits are to be preferred, as the iris then has no pigment, and 0·2 cc. aqueous humor is withdrawn before the injection of 0·1–0·2 cc. infective suspension. The most constant results are obtained by using testicular passage suspension of rabbits and by subpassage with virulent aqueous humor. A positive reaction with patient's blood was only once obtained. Opacity of the cornea made its appearance between the 7th and 18th day. Rickettsia were present in all corneal preparations in large number especially from the posterior surface and were exclusively intracellular. The inflammatory cell reaction, a kerato-irido-cyclitis, was situated chiefly at the periphery of the cornea, at the junction of iris and cornea, round the canal of Schlemm and in the basal portion of the iris: it consisted of round cells and eosinophils. An exudate, which formed on the posterior surface of the cornea, showed the same cell elements. No general symptoms appeared except in three rabbits, which developed fever for a few days. *W. F. Harvey.*

van Waardenburg (D. A.). Over een geval van tropical typhus en een geval van mijtekoorts in de Residentie Benkoelen.—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1935. May 28. Vol. 75. No. 11. pp. 878–892.

Giunta (Giuseppe). Sopra alcune febbri endemiche della costa dell'Oltregiuba. [**Some Fevers Endemic on the Coast of Oltregiuba.**]—*Ann. di Med. Nav. e Colon.* 1935. July–Aug. 41st Year. Vol. 2. No. 1–2. pp. 493–511. [23 refs.]

[No atlas at our disposal mentions Oltregiuba, but from the casual mention in the text of Benadir, we infer it to be a district of Italian Somaliland.] Febrile attacks are designated by local names according to the districts where they occur such as Chisimaio, Benadir fever, in addition to the better known dengue and papataci fever and

influenza, which goes by the generic name of *kandu*. From the author's account they may be classed under one or other of these last three. A descriptive case of each is given. *H. H. S.*

CHRISTIAN (C. R.). **The Weil-Felix Reaction in Fevers of Uncertain Origin.**—*Jl. Roy. Army Med. Corps.* 1935. Oct. Vol. 65. No. 4. pp. 247–251.

Two mild cases of fever are described, in neither of these was any rash observed at any period, the fever in both cases lasted nine days and the highest point reached was 104·8°F.

Malaria was excluded by careful examination of blood films ; blood, urine, and stool cultures attempted on several occasions during the fever were negative. The white blood cell count was normal, there were no enlarged glands and no other signs or symptoms.

The blood sera gave the following reactions expressed in standard agglutination units in the case of the Widal reaction :—

Case No. I.

	Day of Disease				
	4	7	11	15	19
Weil-Felix—					
"O"					
X19	17	0	0	44	25
X2	32	19	192	367	282
XK	64	64	220	367	367
Widal—					
T.	28	21	42	31	31
A.	28	16	48	48	35
B.	56	71	143	195	133
T. "O"	0	0	19	0	0

Case No. II.

	Day of Disease			
	6	19	13	17
Weil-Felix—				
"O"				
X19	22	44	44	32
X2	19	170	170	170
XK	38	282	282	192
Widal—				
T.	48	375	187	110
A.	63	37	37	37
B.	143	66	72	85
T. "O"	0	0	0	0

Four other cases which were clinically typical of typhus with profuse rash, headache, delirium and insomnia, and polynuclear leucocytosis were also tested and gave practically identical reactions as regards the Weil-Felix test. This paper brings to light two interesting facts ; the first is that mild cases of fever without rash or other classical symptom of typhus fever may give a positive Weil-

Felix reaction even in greater dilution than cases which are clinically true typhus; second that there are in India several serological varieties of typhus fever; in the present series 4 cases gave what might be described as a positive group reaction for X19, X2 and XK, whereas one case in which XK was agglutinated (up to a serum dilution of 1/10,000) gave negative reactions with X2 and X19.

The results of the Weil-Felix reaction and Widal reaction for one of these severe cases is given below for comparison.

	Day of Disease					
	4	8	12	16	20	25
Weil-Felix—						
"O"						
X19	17	17	145	170	192	85
X2	64	64	282	282	282	170
XK	73	183	192	322	322	250
Widal—						
T.	71	71	71	63	80	75
A.	19	38	48	64	64	64
B.	36	72	333	717	427	286
T. "O"	69	84	96	110	74	73

Concentrated "O" emulsions were used in all cases, so that these results can be relied upon; this is not always the case when one reads that cultures of *Proteus X* are subcultured many times in laboratories without any check on the appearance of "H" forms in the cultures. *D. H.*

Schulz (H. H.). **Clinical Experiences with Some Diseases giving a Positive Typhus Reaction.**—*South African Med. Jl.* 1935. Apr. 13. Vol. 9. No. 7. pp. 225–230. With 6 figs.

The author has noted that in his experience cases of fever which give a positive Weil-Felix reaction may be of very varied clinical appearances.

He divides these cases into three main types: 1. The pneumonic type 2. Typhus type. Without definite lung symptoms, but with delirium and meningeal symptoms; the rash in these cases may be atypical and in some cases does not appear at all. 3. Muscular type. Without fever or rash; characterized by insomnia and headache and pain at the back of the neck. The muscles of the legs, arms and back are painful and weak and the gait spastic. *D. H.*

DENGUE AND SANDFLY FEVER.

McClamroch (J. M.) & Vallotton (J. Ralph). **Dengue Fever. Report of One Hundred Cases studied at Jackson Memorial Hospital during the Miami Epidemic, 1934.**—*Southern Med. Jl.* 1935. July. Vol. 28. No. 7. pp. 635–638. With 4 charts. [14 refs.]

In addition to the clinical study some experimental work was carried out. It was found that filtered serum from an active case

was infective for a volunteer. Blood used for transfusion, taken inadvertently during the incubation period of the disease, gave rise to a severe attack in the recipient. All experimental animals tested were found to be resistant. Attempts made to reinfect volunteers after an attack failed.

Rash was noted in 50 per cent. of the cases only and was maculopapular and situated on the chest, abdomen, neck and arms ; enlarged cervical and epitrochlear glands were noted, there was a marked decrease in the number of the polynuclear cells of the blood and an increase in the lymphocytes. One case admitted as dengue with fever and abdominal pain was later diagnosed as appendicitis and operated on. A perforated appendix was found. As the author puts it " a stormy postoperative course followed, culminating in a lethal exodus." This case is interesting in view of the paper by SANNER & LOUMAIGNE which follows. *D. Harvey.*

SANNER (L.) & LOUMAIGNE. A propos d'une forme clinique rare de la dengue et affections voisines. (Dengue like Fevers des auteurs anglais.) [**Concerning a Rare Clinical Type of Dengue and Allied Infections. Dengue-like Fevers.**]—*Arch. Méd. et Pharm. Nav.* 1935. Apr.–May–June. Vol. 125. No. 2. pp. 297–301.

As a rule in dengue pains are complained of all over the body and limbs but not in the abdomen. But in the 3 cases described in this paper abdominal pain was a marked symptom. There was rigidity of the muscles of the abdomen and tenderness ; appendicitis was suspected and one of the cases was operated on, but the appendix was found to be healthy although the surrounding tissues and the appendix itself were oedematous. *D. H.*

SHARP (William B.) & HOLLAR (Emory). **Immunity in Dengue Fever.** —*Amer. Jl. Trop. Med.* 1935. May. Vol. 15. No. 3. pp. 247–264. [62 refs.]

A review of the literature on the subject with observations on local epidemics of the disease in Galveston, Texas.

Judging from the widespread nature of epidemics of the disease when they occur in populations not previously exposed to infection there would appear to be no natural resistance in any race ; resistance is acquired and is due to one or more previous attacks of the disease. In Galveston, Texas, for instance two-thirds of the population were attacked during the epidemic in 1922.

Freedom from attack during an epidemic is either due to immunity derived from a previous attack or to protection from mosquitoes by screening. Relapses and reinfections do occur but as a general rule there is protection for some considerable time, at least one year. It has been suggested that these reinfections may be due to different strains of virus ; others suggest that reported second attacks of dengue may arise from mistakes in diagnosis. As compared with yellow fever, a disease with which dengue has often been confused, the immunity following an attack of dengue is neither universal nor permanent as it is following yellow fever.

Attacks of dengue fever do not protect against yellow nor vice versa, neither do the sera of dengue patients neutralize the yellow fever virus.

The sera of several people who were known to have had dengue previously were taken and were tested by the mouse protection test but there was no evidence whatever of any protection; some of these people had had very severe attacks of dengue and a diagnosis of yellow fever had been suggested. [See this *Bulletin*, 1931, Vol. 28, p. 718; 1932, Vol. 29, p. 14; 1933, Vol. 30, p. 408.] *D. H.*

Murray (A. J.). A Case of Paratyphoid "A" simulating Dengue.—*West African Med. Jl.* 1934. Oct. Vol. 8. No. 2. p. 15.

Shortt (H. E.), Poole (L. T.) & Stephens (E. D.). **Note on Some Experiments with Sandfly Fever Blood and Serum.**—*Indian Jl. Med. Res.* 1935. July. Vol. 23. No. 1. pp. 279–284. With 2 charts.

The authors refer to previous work by them on the same subject. The object of the present study was to see if men who had had sandfly fever the previous season could be reinfected in the following year.

Blood from 3 cases of sandfly fever was sent from Peshawar to Kasauli. These bloods were divided into two parts and one part was injected into a volunteer who had not previously been inoculated, the other part into an old volunteer who had had fever in the previous year. The results were 2 typical attacks in 2 new volunteers, 2 modified attacks in 2 old volunteers. One blood failed to infect either old or new. Serum sent from a case of sandfly fever was found to be infective but, if convalescent serum was first inoculated and then the virulent serum, no fever resulted; when tested later this volunteer did not develop fever. *D. H.*

Shortt (H. E.), Poole (L. T.) & Stephens (E. D.). Sandfly Fever on the Indian Frontier. A Preliminary Note on Some Laboratory Investigations. —*Jl. Roy. Army Med. Corps.* 1934. Dec. Vol. 63. No. 6. pp. 361–367; & 1935. Jan. Vol. 64. No. 1. pp. 17–24. With 5 charts. [10 refs.]

CARRION'S DISEASE.

Escomel (E.). Localisation géographique de la maladie de Carrion ou *Verrugu* du Pérou. [**Geographical Distribution of Carrion's Disease.**]—*Bull. Soc. Path. Exot.* 1935. June 12. Vol. 28. No. 6. pp. 405–407.

This disease is found only in Peru, and in that country it is confined to certain valleys and ravines where special vegetation and sandflies exist.

Carrion's disease commences at 2,000 feet and ceases at 8,000 feet. The particular plants are lactatious cactus plants such as euphorbia and the sandflies are *Phlebotomus* Noguchi and *Phlebotomus verrucanus*. It is suggested that these plants are the sources of food and of virus to the fly. Certain investigators have found Bartonella in the latex of these plants. It is suggested that clearing of these plants from the valleys and ravines would be a method of prevention of the disease. *D. Harvey.*

RELAPSING FEVER AND OTHER SPIROCHAETOSES.

CUNNINGHAM (J.) & FRASER (A. G. L.). **Further Observations on Indian Relapsing Fever. Part II. The Serology of Relapsing Fever in Human Beings.**—*Indian Jl. Med. Res.* 1935. Apr. Vol. 22. No. 4. pp. 595–616. With 9 charts. [33 refs.]

This article is a continuation of the authors' observations on the serology of Indian relapsing fever [see this *Bulletin*, 1934, Vol. 31, p. 847] and shows that the results previously obtained in experimental animals agree with those derived from the study of human infections.

The various types of *Spirochaeta carteri* isolated from louse-borne epidemics of relapsing fever in North and South India were found to be identical.

The following human sera were tested against types A, B and C :—

(*a*) Samples taken from 132 cases obtained from an epidemic of the disease in the Nilgiri Hills in the Madras Presidency in 1924.

(*b*) Eighteen samples from three sporadic outbreaks occurring in the Punjab—Multan, Hazro and Dera Ghazi Khan.

(*c*) Twenty-nine samples from three areas in the North-West Frontier—The Kurram Valley, Drosh (near Chitral) and Quetta.

Most of the sera were found to belong to types A and B, and the antibody formation in these human cases followed the same course as that already described in experimental animals. Most of the sera derived from patients on the North-West Frontier failed to react with any of the louse-borne types of spirochaetes. It is possible that there may be some serological affinity between the spirochaetes causing the louse-borne type of relapsing fever and the tick-borne variety occurring in the North-West Frontier, but its extent is doubtful. Where reactions did occur, however, the C type was the one most frequently involved.

Sera obtained from both types of relapsing fever in India, failed to agglutinate three strains of spirochaetes, including two European strains of *S. recurrentis*, and one of *S. duttoni*. *E. Hindle.*

GILLESPIE (James O.). **Relapsing Fever in the United States.**—*Jl. Amer. Med. Assoc.* 1935. May 25. Vol. 104. No. 21. pp. 1878–1881. With 1 chart. [14 refs.]

A general account of the subject with the object of calling the attention of physicians to the features of a disease which is probably endemic throughout the entire Southern half of the United States, wherever ticks of the genus Ornithodorus find their habitat. *E. H.*

ANDERSON (Charles). Sur la présence d'*O. erraticus* infecté par *Sp. hispanicum* dans la banlieue de Tunis. [**The Presence of** *O. erraticus* **infected with** *S. hispanicum* **in the Neighbourhood of Tunis.**]—*Arch. Inst. Pasteur de Tunis.* 1935. June. Vol. 24. Nos. 3 & 4. pp. 483–492. With 3 charts.

The author has infected guineapigs with a strain of *S. hispanica* by inoculating them with a suspension of the contents of *O. erraticus* collected from burrows of *Mus decumanus* in the neighbourhood of Tunis.

The ticks refused to feed on experimental animals and therefore it was impossible to test whether their bite is infective. The spirochaete was shown to belong to the *hispanica* group by means of cross

immunity tests and as it was shown to be pathogenic to monkeys, *M. cynomolgus*, it is probably infective to man. Attempts to transmit the infection by means of *X. cheopis*, *Haematopinus suis*, *Gyropus gracilis* and *Rhipicephalus sanguineus* all gave negative results.

This discovery of infected *O. erraticus* in North Tunis fills one of the gaps in the distribution of Spanish African relapsing fever in North Africa. *E. H.*

Colas-Belcour (J.). Evolution post-embryonnaire et mues de l'*Ornithodorus erraticus*. [**The Post-Embryonic Development and Moults of** *O. erraticus*.]—*Bull. Soc. Path. Exot.* 1935. July 10. Vol. 28. No. 7. pp. 604–606.

At temperatures of 28° and 32°C., with a relative humidity of 90 per cent., the number of nymphal stages was found to vary from 3 to 5. Third stage nymphs when moulting may give rise to adults, both male and female, or to 4th stage nymphs; the latter when moulting generally give rise to females, but exceptionally to males, or even to 5th stage nymphs. These invariably gave rise to females at the moult; 6th stage nymphs were never observed. *E. H.*

Wheeler (C. M.), Herms (W. B.) & Meyer (K. F.). **A New Tick Vector of Relapsing Fever in California.**—*Proc. Soc. Experim. Biol. & Med.* 1935. May. Vol. 32. No. 8. pp. 1290–1292.

A demonstration of the transmission of relapsing fever in California by a new species of Ornithodorus, *O. hermsi*, collected from near Lake Tahoe, Big Bear Lake, and various other localities in San Bernardino, Eldorado and Placer Counties, California, at elevations ranging from 5,000 to 8,000 feet.

The ticks were found to be naturally infected with the Californian strain of *S. recurrentis* and susceptible animals (mice or monkeys) on which these ticks were fed showed spirochaetes in the blood after various incubation periods. *E. H.*

Tokura (Noboru). Experimentelle Studien ueber die sogenannte Gehirn- und Organpersistenz der *Spirochaeta recurrentis* Duttoni unter dem Einfluss vom Alkoholismus. [**Experimental Studies on the Persistence of So-called Brain- and Organ-Infections of** *Spirochaeta recurrentis* **under the Effect of Alcohol.**]—Reprinted from *Acta Dermat.* 1933. Vol. 21. No. 1–2. pp. 1–27. With 4 coloured figs. on 1 plate. [37 refs.]

The author has studied the behaviour of a strain of *S. duttoni* in two varieties of mice. One of these varieties known as the "T-mice," had a body-weight of approximately 15 gm. and was resistant against the infection (mortality about 16 per cent.), whilst the other variety, the "F-mice," had a body-weight of about 10 gm. and was much more susceptible, with a mortality of about 84 per cent.

One hundred and twenty T-mice were given daily doses of 0·3 cc. of 15 per cent. alcohol intraperitoneally, and after 10 days' treatment were inoculated intraperitoneally with a strain of *S. duttoni*; 120 F-mice were kept as controls and inoculated without being exposed to the effects of alcohol.

Five mice of each group were killed daily and examined for infectivity and also microscopically, especially the brain, liver, spleen and kidney.

The results are given in detail and support the view advanced by the author that residual spirochaetes remain in the blood. Even at the height of the infection it was very rare to find them in the brain tissue, but they might be found in large numbers in the capillaries, not only of the brain, but also of the liver, kidney, etc. These organs were also found to remain infective after the disappearance of the infection from the circulating blood. The spirochaetes are considered to persist in blood islands of the smaller capillaries, resulting from thrombus formation.

The mice exposed to alcohol were found to show blood infection at least 10 days longer than the control mice, and the infectivity of the brain and organs persisted about 10–15 days longer than in the controls. This, however, is not the result of any nerve poisoning as suggested by Semzova [see this *Bulletin*, 1931, Vol. 28, p. 735], since there is no evidence that this spirochaete possesses any neurotropic affinities. *E. H.*

von Jancsó (N.) & Novák (E.). Mikrobiologische Grundlagen der chemotherapeutischen Wirkung. III. Mitteilung: Die Bindung chemotherapeutisch verabreichter Goldverbindungen durch verschiedene Arten von Rekurrensspirochäten. [**The Microbiological Basis of Chemotherapeutic Action. Part III. The Combination of Therapeutically Administered Gold Compounds with Various Species of Relapsing Fever Spirochaete.**]—*Zent. f. Bakt.* I. Abt. Orig. 1935. June 14. Vol. 134. No. 3/4. pp. 159–169. [12 refs.]

Rats and mice infected respectively with strains of *Spirochaeta recurrentis* and *S. usbekistanica* were treated with various gold compounds and the spirochaetes subsequently examined for the presence of combined gold using the microscopic methods developed by the authors [see this *Bulletin*, 1935, Vol. 32, p. 596].

The authors' strain of *S. recurrentis* showed a very marked tendency to take up gold from such diverse compounds as triphal, krysolgan, solganal A and B, and potassium gold cyanide. The union of the gold compounds with the parasite was reversible, however, and by repeated washing of the spirochaetes with fresh serum the gold could be removed.

In the case of *S. usbekistanica* the tendency to take up gold was very slight, for spirochaetes from infected rats treated with maximum doses of either solganal A or B gave negative gold reactions after ultracrystallization, showing that the organisms were impervious to these gold compounds. Since the bodies of these spirochaetes contained no gold the only possibility is that the gold compound is attached to the surface of the organism, perhaps by a kind of monomolecular and reversible adsorption process which could not be detected by the methods employed. The results are all the more difficult to understand since infections of *S. usbekistanica* are more susceptible to treatment with gold preparations than infections of *S. recurrentis*. The reversibility of the reaction suggests that the fixation of the gold is not by

means of chemo-receptors but is rather of the nature of an adsorption phenomenon.

Discussing these results it is pointed out that chemotherapeutic action, in the strict sense of the word, may occur without any parasitotropic fixation. The distinction, however, between localization of medicament in the body of the parasite or only on the surface, is not very great, although theoretically the latter might be interpreted as a case in which the drug acts only through the defence mechanism of the host. In the authors' opinion, the view that the chemotherapeutic treatment of spirochaetal infections depends on the activation of the natural defence mechanism of the host, is founded on insufficient experimental evidence. *E. H.*

Levaditi (C.) & Deutsch (V.). Action du rayonnement total de la lampe à mercure sur le virus récurrentiel. [**The Action of the Total Rays from a Mercury Lamp on the Virus of Relapsing Fever.**]—*C. R. Soc. Biol.* 1935. Vol. 119. No. 22. pp. 679–681.

A note on the different susceptibilities of various stages of relapsing fever spirochaetes to the total rays from a 500 watt mercury lamp. The ordinary spiral forms occurring in the blood of infected mice were found to require an exposure of about 20 minutes at distances of 15 to 38 cm. in order to destroy their virulence ; whilst the invisible phase, occurring in the central nervous system of mice, including residual brain infections up to 57 days after the initial infection, and also the brains of mice killed whilst spirochaetes were still present in the blood, were both found to be very susceptible to the rays, being killed after exposures of 30 and 60 seconds of irradiation.

[It is difficult to understand how an emulsion of the central nervous system of a mouse containing spirochaetes in its blood, could fail to include some of the ordinary blood forms (*état végétatif*) which are stated to be resistant to the action of rays. Consequently the inactivation of such an emulsion by exposures of only 30 and 60 seconds instead of the much longer periods required by infected blood, suggests that the nature of the suspension fluid may have influenced the results.]

E. H.

Marchoux (E.), Chorine (V.) & Koechlin (D.). Infection et immunité conférée par les spirochètes des poules en cultures artificielles. [**Infection and Immunity conferred by Fowl Spirochaetes in Artificial Cultures.**]—*C. R. Soc. Biol.* 1935. Vol. 119. No. 27. pp. 1280–1281.

The authors have tested the results of inoculating fowls with various numbers of fowl spirochaetes that had been isolated for 6 months ; 48 hour cultures were invariably used and the number of spirochaetes in the suspension estimated by means of a haemocytometer.

Seven fowls were inoculated respectively with doses of 50,000, 10,000, 5,000, 3,000, 1,000, 500 and 100 culture spirochaetes. Inoculation of 5,000 or more produced typical infections ; the two fowls inoculated with 3,000 and 1,000 developed immunity without any signs of infection, although the one receiving the higher dose showed

a rise in temperature from the 3rd to the 9th day ; whilst those inoculated with fewer than 1,000 spirochaetes were neither infected nor developed any immunity. *E. H.*

SCHARRER (Berta). Ueber die Feststellung von Dickenunterschieden an lebenden mikroskopischen Objekten, dargelegt am Beispiel der Unterscheidung von Hühner- und Rekurrensspirochäten. [**The Determination of the Thickness of Living Microscopic Objects, based on the Examination of Fowl and Relapsing Fever Spirochaetes.**]—*Arch. f. Protistenk.* 1935. Vol. 85. No. 1. pp. 87–99. With 3 figs. [23 refs.]

The author finds that it is possible to distinguish three degrees of thickness in spirochaetes by the use of different types of condenser. When a film of living *Spirochaeta recurrentis* is examined under the microscope, using *e.g.* a Zeiss X-apochromatic objective (x60) and an ocular x10 or x15, if the film is illuminated by means of a Cardioid condenser with a high numerical aperture (*e.g.* a Siedentopf Cardioid condenser), the spirochaetes show a curious optical phenomenon, each appearing as two parallel bright lines separated by a dark line.

If one uses a dry condenser, however, the spirochaetes lose this double contour and appear as single bright lines. In addition to *S. recurrentis* (European strain), five other strains of relapsing fever (*hispanica*, *usbekistanica*, *duttoni*, *angola* and *crocidurae*) gave similar results, also a strain of *S. novyi*. On the other hand, two strains of the recently created *S. turicatae* [see this *Bulletin*, 1934, Vol. 31, p. 86] showed very indistinct doubling of the contour, indicating that they were more slender than *S. novyi*.

When *S. gallinarum* is similarly examined the spirochaetes appear only as single bright lines, there being no suspicion of any double contours. Spiral organisms thicker than *S. recurrentis*, such as *Spirillum rubrum* Esmarch, show a double contour even when examined with a dry condenser.

No spirochaetes, except the relapsing fever group, were found to show the two appearances with the two types of condenser, so this furnishes a simple and reliable method of determining the approximate thickness of fine objects under the dark ground. *E. H.*

RAT-BITE FEVER.

SCHINZEL (Alfred). Ueber die bei einem Fall von Rattenbisskrankheit in Rostock 1931 als Erreger nachgewiesenen Spirillen (*Sp. minus*). [**The Demonstration of Spirilla** (*S. minus*) **from a Case of Rat-Bite Fever in Rostock, in 1931.**]—*Zent. f. Bakt.* I. Abt. Orig. 1935. July 23. Vol. 134. No. 5/6. pp. 302–305. With 2 figs.

The description of a typical case of the disease in a child bitten on the hands and arms by a rat. The symptoms developed 18 days later and spirilla were isolated from the blood and lymph glands and the infection transmitted to mice, rats and guineapigs. The patient's blood gave a positive Wassermann reaction [with syphilitic liver extract] and infected guineapigs also gave positive reactions with

syphilitic antigens and complement fixation with extracts of the organs of mice infected with *S. minus*. The serum of infected mice did not show the development of any antibodies against the parasite. According to the author this is the first case of rat-bite fever recorded in Germany in which the causative agent has been isolated.

E. Hindle.

Ozeki (Yaichiro). Ueber die durch die *Spirochaeta morsus muris* erzeugte Veränderung des Augenlides bei Maus. Anhang : Ueber den Haarausfall bei Maus durch *Spirochaeta morsus muris*. [**The Changes produced by** *Spirochaeta morsus muris* **in the Eye-lids of Mice. Appendix : The Loss of Hair in Mice caused by** *S. m. muris*.]—*Japanese Jl. Dermat. & Urol.* 1935. May. Vol. 37. No. 5. [In Japanese pp. 615–638. With 21 figs. (3 coloured on 1 plate). [47 refs.] German summary pp. 109–112.]

Animals infected with rat-bite fever frequently show changes in the skin surrounding such openings as the eyes, mouth, anus, etc., and the author has studied this phenomenon in the case of the eyelids of mice. The changes developed at varying intervals after the inoculation ; 28 days in 4·9 per cent. ; 33 days in 18·5 ; 38 days in 25 ; 52 days in 27 ; and 63 days in 19·2 per cent. of the cases.

The spirilla were found to invade the skin about 14 days after the inoculation and to be especially abundant in the subcutaneous vessels and corium. The numbers of parasites increase and this is accompanied by marked cellular infiltration, which interferes with the general circulation, including that of the hair follicles, with the resulting loss of hair. About 40 to 50 days after inoculation the mouse generally develops an immunity and the spirilla disappear, but the cellular infiltration persists for some time afterwards. *E. H.*

LEPTOSPIROSIS.

Kotorii (Saigo). Zur Klinik der sogenannten "Hasamiyami." (Weil-ähnliche endemische Krankheit.) [**The Clinics of So-called Hasamiyami. An Endemic Disease of the Weil Type.**]—*Klin. Woch.* 1935. Aug. 10. Vol. 14. No. 32. pp. 1147–1149.

An account of Hasami fever, an endemic disease of the Weil type, occurring in the Hasami district, near Nagasaki, based on the study of 418 cases treated in the author's private clinic between 1903 and 1934. The disease is identical with Akiyami and Autumn fever, the aetiological agent being *Spirochaeta autumnalis*.

The author gives details showing that nearly all the cases of the disease occur in the autumn months of August, September and October. The general symptoms are sudden fever with rigors, severe headache, muscle pains and digestive disturbances. The most important characteristics are inflammation of the conjunctiva and of the throat, jaundice, subcutaneous haemorrhages, swelling of the lymph glands, albuminuria and leucocytosis. *E. Hindle.*

KANEKO (Kôkichi) ; KOTORII (Saigo) ; AOKI (Yoshio) ; MORIMOTO (Tsutomu). Weitere Studien ueber die " Hasamiyami." I. Statistische Betrachtungen der im Distrikt Hasami gefangenen, spirochätentragenden Feldratten. [**Further Studies on " Hasamiyami." I. A Statistical Consideration of the Wild Rodents carrying Spirochaetes in the Hasami District.**] [KANEKO, KOTORII & AOKI]. *Ztschr. f. Hyg. u. Infektionskr.* 1935. July 18. Vol. 117. No. 2. pp. 202–207. With 3 figs. II. Vergleichende Untersuchungen ueber die Methoden zum Nachweis des Erregers von " Hasamiyami " (Spirochaeta autumnalis) im Rattenkörper. [**II. A Comparative Investigation of the Methods of finding the Causative Agent of " Hasamiyami "** (*S. autumnalis*) **in the Body of the Rodent.**] [AOKI, KANEKO & MORIMOTO].—*Ibid.* pp. 208–215. [22 refs.]

I. The authors have examined 1,930 rodents captured in the Hasami District between July, 1932, and September, 1933. About 11 per cent. were found to be carrying a spirochaete belonging to the strain Akiyami A. (= *Sp. autumnalis*). The occurrence of the spirochaetes in the four species examined is shown in the following table :—

Species of rodent	No. examined	No. positive	Percentage	Sex	Percentage
Rattus n. norvegicus	444	0	0	—	—
R. rattus alexandrinus	38	0	0	—	—
Apodemus speciosus speciosus	1,426	209	14·7	♂ 137 ♀ 72	16·7 11·8
Microtus montebelli ...	22	1	4·5	♂ 0 ♀ 1	8·3
TOTAL ...	1,930	210	10·9	♂ 137 ♀ 73	♂ 13·1 ♀ 8·3

A total of 298 rodents collected in houses in the same district were also examined, but were uniformly negative. They belonged to three species, *Rattus norvegicus norvegicus*, *R. rattus alexandrinus* and *Suncus caeruleus* var. *riutsuanus*.

From these results it would seem that the field mouse *Apodemus speciosus* is by far the most important carrier of the infection and this view is supported by other evidence. The spread of the infection amongst the captured rodents was strikingly shown by the examination of animals that had been kept together in cages for periods of 10, 20 and 30 days respectively, which showed percentage infections of 8·0, 15·1 and 45·5. The influence of age is shown in a curve giving the incidence of infection corresponding to body-weight, from which it appears that the percentage of infected animals, both males and females, rises until they are full grown, with a body-weight of 51–58 gm., and falls very suddenly in animals above this weight. The spirochaetes occur mainly in the kidney and urine, only one in ten of the infected animals showing a positive liver.

II. The authors examined 50 *Apodemus speciosus* from the Hasami district for spirochaetes using various methods in order to determine

which was the best. Their results are given in the following table in which the figures indicate the number of positive findings out of the 50 examined :—

Microscopical methods			Guineapig inoculation	Culture method	Immunity reaction	
Dark ground	Stained Mühlpfordt-Ruge	Stained Levaditi			Agglutination	Adhesion
14=28%	12=24%	10=20%	16=32%	20=40%	18=36%	43=86%

The culture method seems to give the best results but it is necessary to have fresh material.

The results of the agglutination tests did not always agree with those obtained by culture, for 7 mice contained spirochaetes and gave negative agglutination tests, whilst 5 mice were serologically positive, but gave negative cultures. It is probable that in one group the infections were too recent for the development of antibodies, whilst in the other group the antibodies had persisted in the blood after the disappearance of the infection. The adhesion test was found to be very unreliable, giving positive reactions in a large number of cases not only with the strain under examination, but also with *S. icterohaemorrhagiae*, *S. hebdomadis*, another strain of *S. autumnalis*, and also with the water spirochaete, *S. biflexa*. *E. H.*

Haslé (G.), Toullec (F.) & Vaucel (M.). Spirochétose ictérigène au Tonkin. [**Spirochaetal Jaundice in Tonkin.**]—*Bull. Soc. Path. Exot.* 1935. July 10. Vol. 28. No. 7. pp. 551–553.

A record of three cases of Weil's disease, two European and one native, occurring during September, 1934, at Hanoï.

One case showed meningitic symptoms and general septicaemia of *Bact. coli*, and died after 18 days. A guineapig inoculated with cerebrospinal fluid from this case, showed a typical infection with *S. icterohaemorrhagiae*. The other two cases were benign, but all three showed spirochaetes in the urine after the 10th day of illness. The inoculation of the centrifuged deposit from these urines, however, failed to infect guineapigs. Blood examinations of the two survivors only once showed the presence of immunisins, but both gave strongly positive sero-agglutination reaction.

Out of 142 local rats examined, only four were found to be infected with *S. icterohaemorrhagiae*. *E. H.*

Marchesi (Franco). **The Spirochaeta of Infective Haemorrhagic Jaundice found in Rats in Rome.**—*Jl. Trop. Med. & Hyg.* 1935. Sept. 2. Vol. 38. No. 17. pp. 213–214. [22 refs.]

The author isolated three strains of *Spirochaeta icterohaemorrhagiae* from rats caught in Roman sewers. Inoculated into guineapigs the spirochaete produced typical symptoms of Weil's disease. The organisms were found to be capable of living up to seven days in filtered Tiber water, and therefore there is danger of the transmission of the disease from rats to man by means of the river waters. *E. H.*

Uhlenhuth & Zimmermann. Zur Epidemiologie und Therapie der Weilschen Krankheit. [**The Epidemiology and Treatment of Weil's Disease.**]—*Zent. f. Bakt.* I. Abt. Orig. 1935. Vol. 135. No. 1/3. Beiheft pp. 151*–154*.

A general account of the subject.

With reference to the occurrence of the disease in dogs up to the present the authors have examined the sera of 67 individuals and found that 15 per cent. gave positive reactions against the ordinary strain of *S. icterohaemorrhagiae*. In addition to this strain, dogs may also be infected with the *canicola* strain discovered by Schüffner [see this *Bulletin*, 1934, Vol. 31, p. 853] and this type also may be infective to man.

The use of either convalescent serum, rabbit anti-serum, or bismuth compounds is recommended for treatment. *E. H.*

SPRUE.

Reed (Alfred C.) & Johnstone (Herbert G.). **A Clinical Study of Intestinal Fungi.**—*Amer. Jl. Trop. Med.* 1935. Mar. Vol. 15. No. 2. pp. 155–174. [11 refs.]

In spite of, or perhaps we may say because of, the negative findings this article is of considerable importance. The authors have examined by cultivation the stools of 50 patients suffering from various diseases to determine the nature of any fungi present and to establish, if possible, the relation of the fungus to the disease whether as cause or as secondary invader and also their pathogenic relationship.

Of the fifty, 24 had no fungi ; 24 showed evidence of amoebiasis, 15 had chronic diarrhoea, 7 were cases of sprue. It is strange to find how evenly divided were those with and those without fungi. Thus of the 24 with amoebiasis 12 were positive and 12 negative ; of the 15 with chronic diarrhoea, 7 were positive, 8 negative ; of the 7 sprue patients 4 were positive. Among the four positive sprue cases Type III Monilia, *M. candida*, was found in three and a Torula in the other. Country of previous residence seemed to have little if any influence. Thirteen had lived in California, 6 were positive, 7 negative ; 13 had visited or lived in Europe, 7 were positive, 6 negative ; 15 had lived in the Far East, their respective figures were 8 and 7 ; 25 had lived in the United States, 13 were positive. It was only in the group of 10 who had lived in Central or South America that positives preponderated, 8 to 2 negative.

Some type of Monilia was the fungus most often isolated. The authors come to the conclusion that in no case were they convinced that there was any pathogenic relationship between the fungus and the disease ; it may have modified the symptomatology but, though possible, this is difficult to prove. *H. H. S.*

Mackie (Thomas T.) & Pound (Robert E.). **Changes in the Gastro-Intestinal Tract in Deficiency States with Special Reference to the Small Intestine : a Roentgenologic and Clinical Study of Forty Cases.**—*Jl. Amer. Med. Assoc.* 1935. Feb. 23. Vol. 104. No. 8. pp. 613–618. With 8 figs. [10 refs.]

Defective absorption is an outstanding feature in sprue and may affect the development of the deficiency factors of this disease. The authors have observed signs of advanced deficiency disease in several cases of ulcerative colitis, such as the affections of the tongue and buccal mucosa (as in sprue, pellagra and pernicious anaemia), the skin changes (as in pellagra), oedema and reduction of blood calcium, etc. The association of these deficiency states with chronic ulcerative colitis has led the authors to think that they may be aetiologically related, while too rapid passage of food or abnormalities of the small intestine would lead to defective absorption.

They have studied radiologically, after a barium meal, 37 cases of chronic ulcerative colitis and three of sprue. Nine of the former gave good evidence of infection by some strain of *Bact. dysenteriae* and six others agglutinated stock strains to diagnostic titre. From their observations of the progress of the barium meal the authors deduce " varying degrees of oedema of the mucosa, derangement of the normal motor function and abnormal variations in tone of the intestinal musculature." The pathological conditions at the base of these

changes are not definite. Tissues were obtained from four of the cases but no inference of any value could be made from them. There were, however, marked similarities in the roentgen changes as observed in the colitis and the sprue cases, although in two of the latter the disease was quiescent at the time. The authors note, however, that " it is impossible at the present time to state whether the small intestine changes are a factor in the production of the deficiency state or the result of such states." [One of the three cases of sprue was noted in this *Bulletin*, 1935, Vol. 32, p. 44.] *H. H. S.*

MACKIE (T. T.), MILLER (D. K.) & RHOADS (C. P.). **Sprue : Roentgenologic Changes in the Small Intestine.**—*Amer. Jl. Trop. Med.* 1935. Sept. Vol. 15. No. 5. pp. 571–589. With 4 figs. [14 refs.]

Recent work on sprue tends to favour the theory that insufficient intake of food, or defective absorption, or inadequate utilization of it, or a combination of these takes part in the aetiology or pathogeny of the condition. The symptoms of sprue, the stomatitis, the diarrhoea, the anaemia, not infrequently improve greatly on the parenteral administration of liver extract, when oral administration fails. This is strongly suggestive of malabsorption of the extract, and by parity of reasoning lack of absorption of certain food essentials.

The authors give in the letterpress of their article and in tabular form the results of X-ray examination immediately after and at half-hourly or hourly intervals after 4-oz. barium meals taken by 17 sprue patients. They noted the calibre variation of the intestine, its segmentation and " pocketing," the time taken for the meal to reach the caecum, and the barium residue in the small intestine. They found that the outline was often abnormal and that localized segments filled and formed pockets like diverticula, while in the lower ileum the outline might be straightened " suggesting lack of pliability of the [intestinal] wall." They found no evidence, radiographically, of ulceration. Five of the patients were similarly examined at intervals when improvement was taking place following treatment, and the changes detailed were observed to be less marked.

CASTLE, HEATH and STRAUSS have recorded a lack of the gastric anti-anaemic principle, and abnormal states of the intestine have, as is well known, been found in experimental avitaminosis. Although the findings mentioned above seem quite definite by X-rays, it is not yet possible to gauge their importance in the pathogeny of sprue, for there is no definite proof post-mortem of any characteristic lesions. But we may say that this very absence of local reaction, histologically, is evidence against the local infection theory while consistent with that of defective absorption. Details of the five patients re-examined are given. The authors sum up their conclusions in the following words :—

" 1. Characteristic changes in the small intestine have been demonstrated by X-ray in seventeen cases of sprue.

" 2. Similar changes have been observed in other conditions exhibiting clinical evidence of multiple deficiency states.

" 3. The intensity and extent of the abnormalities in the small intestine vary directly with the severity of the clinical picture in sprue, and they regress under specific therapy.

" 4. It is suggested that they may play a part in the defective absorption or utilization of essential food factors." *H. H. S.*

Pillai (M. J. S.) & Murthi (K. N.). **Further Observations on the Radiological and General Findings in Sprue.**—*Calcutta Med. Jl.* 1935. Oct. Vol. 30. No. 4. pp. 225–230.

In 1931 the authors published a paper on Radiological Signs in Sprue [see this *Bulletin*, 1932, Vol. 29, p. 8] and now report other cases examined in the same way. Of 14 cases 8 showed evidence of diverticulitis of the large intestine while the upper part of the alimentary tract was free of inflammation, *i.e.* what they regard as the ascending type. The remainder of the paper is concerned with discussion, largely hypothetical, on the way in which the condition and associated lesions may be set up, by endocrine or toxic action, but since there has not yet been an opportunity to verify these suspicions by autopsy there is no need at present to consider them more fully. *H. H. S.*

Nicholls (Lucius). **Sprue and Vitamin Deficiency.**—*Ceylon Jl. Sci.* (Sect. D. Med. Sci.). 1934. Dec. 8. Vol. 3. Pt. 3. pp. 173–176.

The author's views on sprue are given in his summary of this paper :—

"The pathology and clinical course of sprue are those of a deficiency disease. The deficiency is not in the diet, but is due to various causes producing a preliminary damage of the epithelium of the small intestine, which lowers its capacity to absorb the necessary vitamins, and this may lead to impairment of the metabolic assimilation."

He believes that it is not the lack of vitamins, especially vitamin A, in the diet, but lack of absorption of it that is the prime cause or that a disordered metabolism may prevent the normal assimilation of vitamins after absorption. No fresh evidence is adduced and the theory leaves unexplained the peculiar geographical distribution of the disease and, more important, the long latent period, 10 years or more, which may elapse after a person has left the tropics before symptoms appear, when during that interval he has been living under excellent conditions.

H. H. S.

van Steenis (P. B.). Tropische spruw, zwangerschap en eczeem. [**Sprue. Eczema as a Complication of Sprue in Pregnancy.**]—*Nederl. Tijdschr. v. Geneesk.* 1935. May 4. Vol. 79. No. 18. pp. 2062–2072. [18 refs.] English summary.

The summary runs thus :—

"Among 38 cases of sprue in women, 33 of whom were married and in the age-period of child-bearing, 12 occurred during pregnancy (36 pCt.). Eight of these were primary cases of sprue in pregnancy, 4 recurrences of pre-existing sprue during pregnancy. The symptoms appeared mainly after the 6th month; after delivery in general recovery or marked improvement set in.

"Sprue of pregnancy does not differ materially from other cases in its symptoms. As a complication in 4 of the 12 cases eczema was noticed, appearing respectively in the 7th month, 8th month of pregnancy, 10 days respectively 2 months after delivery. In the first three patients it was much generalised on the trunk, extremities and genital area and subsided soon after delivery. Neither in sprue nor in pregnancy is eczema a common complication."

Muller (P.). Bepaling van de hoeveelheid vet in faeces. [**Determination of the Fat Content of Faeces.**]—*Nederl. Tijdschr. v. Geneesk.* 1935. Aug. 17. Vol. 79. No. 33. pp. 3960–3962. English summary (6 lines).

Under the methods in customary use for determination of saponified and unsaponified fat in the faeces the specimen has to be dried as a preliminary. This is a tedious procedure and obviated by that described, in which acidified acetone is employed as the first extraction fluid. The acetone is then distilled off and the residue shaken with petroleum ether as the second extraction fluid. Thereafter the usual procedure of drying, weighing and titrating is followed. For actual details the original should be consulted. A table of results comparing the total fats and fatty acids by the acetone and the ether methods in several cases is given which shows that the two correspond very closely. *H. H. S.*

Fairley (N. Hamilton). **Tropical Sprue and its Modern Treatment.**—*Brit. Med. Jl.* 1934. Dec. 29. pp. 1192–1194. With 1 chart.

This paper was read at the meeting of the Tropical Medicine Section of the British Medical Association held last year and sums up very clearly our present knowledge regarding the treatment of sprue, and the most recent views as to its aetiology. The chief laboratory findings and points of importance in differential diagnosis are stated with the authority of one who has made an intensive study of the subject. The author, after mentioning views on aetiology which are now of little more than historical interest—those of Ashford, Elders, and Scott—gives his opinion that " sprue arises as a functional breakdown in the gastro-intestine, and that any factor or factors depressing its secretory or absorptive function will predispose," and he mentions malaria and dysentery as possible depressors of gastric secretion. This, of course, as the author would probably be the first to concede, does not clear up the vexed question of the aetiology of sprue, but merely throws the problem back and leaves unanswered the questions why this condition of depression of gastric secretion or alimentary function occurs to a small proportion only of persons subjected to similar conditions of environment and régime and why the onset of symptoms is sometimes delayed for years after removal from such environment.

Dr. Fairley gives details of the high protein, low fat, low carbohydrate diet or graded diets which have proved so successful in his hands and of the use of liver extract *per os* for the anaemia. He has rarely found it necessary to have recourse to the parenteral administration of liver.

He gives an example of a sprue patient who, after repeated attempts, failed to respond to liver therapy *per os*, but whose blood showed active and rapid regeneration after intramuscular injections (6 cc.) of campolon [a preparation of liver extract]. He does not omit to mention the need for care in diet and routine after cure to guard against relapse. *H. H. S.*

Castle (W. B.), Rhoads (C. P.), Lawson (H. A.) & Payne (G. C.). **Etiology and Treatment of Sprue. Observations on Patients in Puerto Rico and Subsequent Experiments on Animals.**—*Arch. Intern. Med.* 1935. Oct. Vol. 56. No. 4. pp. 627–699. With 6 charts. [136 refs.]

This is a long paper dealing not only widely but also deeply with the subject. It is too full and too detailed for any abstract adequately

to do it justice and it should be read in the original by those interested. It would form an excellent chapter in a treatise on tropical medicine and with its 136 references omits little of real importance which has been written on sprue since HILLARY's classic appeared in the latter half of the eighteenth century. The authors take up in turn the history of sprue, the aetiology and clinical picture, describing and discussing the symptoms, the blood and marrow changes, the relations between sprue, pellagra and pernicious anaemia. [In the reviewer's opinion too much is made of possible relation and resemblance to pellagra; to those who have practised in the tropics the conditions are clinically so distinct that to insist on the few points of similarity tends rather to confuse the issue. Experimentally, in animals regulation of diet can result in "stomatitis, salivation, diarrhoea and, in some instances, dermatitis. . . . It appears to us, however, that if the cutaneous lesions are excepted the resemblance of these conditions to pellagra is no greater than their resemblance to sprue." Quite so, or even poisoning by mercury.] To treat seriously in these days the Monilia theory is but thrashing a dead horse. The authors give an excellent account of the possible combination of the three factors in aetiology: extrinsic of dietetic origin, intrinsic in the gastric secretion or the lack of them and defective absorption. The analogies between the anaemia of sprue and pernicious anaemia are well presented and the treatment, especially by liver, is considered at length.

The conclusions are best given in the authors' own words:—

"It is believed, therefore, that in sprue, as in pernicious anemia, there is involved the failure of a reaction between an extrinsic factor in the diet, associated in several substances with vitamin B_2 (G), and an intrinsic factor, present in the gastric contents of the normal person. In addition, difficulty with the absorption of substances from the intestinal tract resulting from this hematopoietic reaction is probably involved in certain instances of both diseases. In different patients with sprue the relative importance of these mechanisms is variable. Sprue with macrocytic anemia thus arises from the variable participation of three defects: of the extrinsic factor, of the intrinsic factor and of absorption. Dietary deficiency of iron, gastric anacidity and intestinal impermeability may also decrease the normal intake of iron.

"By means of diets deficient in sources of the extrinsic factor or closely related substances, lingual and gastro-intestinal lesions, macrocytic anemia with megaloblastic bone marrow and degenerative lesions of the spinal cord have been produced in animals. These manifestations can be abolished by means of liver extract or the extrinsic factor. The gastric secretion of pigs fed appropriately defective diets loses its normal content of the intrinsic factor, and the liver becomes deficient in substances normally present and capable of producing increased formation of blood in cases of pernicious anemia. Therefore, the disease picture in animals may reasonably be regarded as analogous to that in patients with sprue. Appropriate dietary defects in man may likewise initiate the physiologic disturbances of the alimentary tract subsequently involved in the production of sprue.

"The evidence for the primary etiologic relationship of yeastlike organisms to sprue is not convincingly supported by observations on animals or on man.

"The administration of adequate doses of liver extracts effective in pernicious anemia, especially by parenteral injection, is fundamental

in the treatment of sprue and its macrocytic anemia. The accessory use of iron is indicated for certain patients.

" It is emphasized that adequate doses of liver extract are as important in controlling the manifestations of the alimentary tract as in promoting the formation of blood in cases of sprue." *H. H. S.*

BROOKE (Gilbert E.). **Tropical Aphthae, or Sprue, and its Treatment.**—*Jl. Trop. Med. & Hyg.* 1935. Feb. 1. Vol. 38. No. 3. pp. 29–33.

This article starts with a fairly comprehensive summary of the theories which have been brought forward since the beginning of the century as regards the aetiology of sprue ; this is followed by a few remarks on pathology, symptoms and treatment as gleaned from the literature.

The author makes yet another suggestion as to causation, namely a predisposition brought about by deficiency in vitamins A and G, and on the top of this an infection possibly conveyed by cockroaches—a sort of half-way house to the termite theory.

The author, who has himself suffered from sprue, ends with a detailed description of the diet which he has found suitable in his own case and which, with the magnanimity characteristic of dieticians in general and sprue subjects in particular, he here communicates for others to try. For the ingredients and modes of preparation of the food the original paper must be consulted ; full details are given.

H. H. S.

VAN PRAAG (André). Données nouvelles sur la sprue nostras. [**Non-Tropical Sprue.**]—*Bruxelles-Méd.* 1935. June 2. Vol. 15. No. 31. pp. 843–852. [15 refs.]

This forms an interesting addition to the growing list of cases of non-tropical sprue.

The patient was a woman of 32 years, unmarried, a dressmaker, who had enjoyed good health until two years before she consulted the author. She had never been outside Europe. Her symptoms were diarrhoea, with pale, bulky, frothy stools, starting at 5 or 6 a.m. and continuing at intervals during the morning. For 18 months she had had sore tongue and a burning sensation in the mouth. She had lost 20–25 kgm. in weight, and the abdominal distension " contrasted with the general wasting." The stools were characteristic, both macroscopically and microscopically. Blood examination gave red cells, 2,510,000, white 6,000 per cmm. Hb. 85 per cent., C.I. 1·7; Calcium 8·2 mgm. per cent. Chvostek's sign was present.

She was placed under a mixture of treatments which makes it difficult to gauge which was responsible for the improvement that followed. She was kept in bed, dieted with fruit alternating with milk and twice weekly the juice of 1 lb. of meat. Calcium was given by mouth, parathyrone by injection followed by " Pernaemon." With the exception of a slight relapse, due probably to diet indiscretion, progress was uneventful, and in 5 months she had gained 8 kgm. in weight, stools were reduced to two on rising, blood calcium was 9·3 per cent. and the patient left saying that she felt perfectly well. *H. H. S.*

Enneking (J. A. M. J.). Een genezen geval van inheemsche spruw met spontane fracturen. [**A Cured Case of Home Sprue with Spontaneous Fractures.**]—*Nederl. Tijdschr. v. Geneesk.* 1935. June 29. Vol. 79. No. 26. pp. 3175–3185. With 2 figs. [21 refs.] English summary (7 lines).

The syndrome which comprises fat diarrhoea, hyper- or hypochromic anaemia, osteoporosis and tetany has, with increasing frequency, been described as non-tropical sprue. Such a case in a shoemaker of 59 years, who had never been in the tropics, is given in detail and is here briefly summarized :—

Symptomatology.—On admission in the autumn of 1933 the patient showed emaciation, with good appetite, symptoms of tetany which did not diminish on administration of calcium lactate, and diarrhoea, which was not influenced by diet. Stools 4 daily, voluminous, thinly pultaceous, offensive, yellow and fatty, becoming definitely sprue-like.

Examination.—Marked calcium deficiency in all bones as estimated by X-ray and fractures of the 4th, 5th, 6th and 7th ribs. Skin dry and slightly yellow, mucosae slightly anaemic, no icterus. Tongue neither glazed nor red originally, but later pain in, and vesiculation of, mouth and tongue. Blood pressure 105/70. Urine : trace of albumin, no glycosuria, no Bence-Jones protein, much urobilin, many hyaline and some granular and leucocyte casts. Temperature normal. Weight 41·2 kilogm., height 1·56 metres. Wassermann negative. A fractional test meal showed complete absence of hydrochloric acid and a total acidity of 5 to 7. The blood showed hyperchromic anaemia (erythrocytes 1,600,000. Hb 60–70), anisocytosis, poikilocytosis, slight polychromasia, many nucleated red cells (68 per 200 leucocytes), slight leucocytosis, normal differential count and increased sedimentation rate (1 hr. 34, 2 hrs. 72). Calcium content of the blood serum 4 to 5 mgm. per cent. and inorganic phosphorus content 2·25 mgm. per cent. On a diet which should have shown 100 mgm. calcium in the urine there was excreted only 25 mgm. Bilirubin content of the blood serum increased (0·006 mgm /cc.).

Treatment.—At first 200 gm. raw liver daily made up with salad and tomatoes ; 10 mgm. calc. lactate in wafer twice daily combined with 15 drops davitamon ; hydrochloric acid, pepsin and fat-poor diet with good result. Subsequently general ultraviolet irradiation and further improvement. Finally 5 drops davitamon once every 3 days, chalk powder 3 times daily and one injection of liver every 14 days.

Result :—In February 1935. Pain disappeared. Fractures healed. Still achlorhydria and no free hydrochloric acid. On subcutaneous injection of histamine there occurred abundant gastric secretion and 1 hr. later there was hydrochloric acidity of 62 and a total acidity of 75. Weight 52·5 kilogm. Urine had become normal. Stool once daily and appeared normal with only a little neutral and split fat (microscopically). Blood picture nearly normal. General condition excellent. Could walk for hours without any complaint. The calcium content of the blood had increased to 9·1 mgm. and the phosphorus to 3 mgm. per cent. [The constitution of davitamon is not stated.] *W. F. Harvey.*

Snell (Albert M.). Clinical Observations on Non-Tropical Sprue.—*Southern Med. Jl.* 1935. June. Vol. 28. No. 6. pp. 516–520. [26 refs.]

Mindline (J.) & Rosenheim (M. L.). **Duodenocolic Fistula simulating Idiopathic Steatorrhoea.**—*Lancet.* 1935. Oct. 5. pp. 764–767. [24 refs.]

The authors describe the case of a man of 43 years, who 24 years before had served in India and had had malaria but no other illness. He was admitted to hospital with fever (up to 102°F.) and was passing

pale, semisolid stools, which showed excess of fatty acids, but not of soaps or neutral fats. Blood count gave 4½ million red cells, 9,200 white per cmm., Hb. 80 per cent., blood calcium normal. He left hospital with some improvement in a month, but returned 6 months later with low blood pressure, loss of weight (18 lbs.), pallor, distended abdomen, ascites and was passing 2–4 pale, bulky, pultaceous stools daily. The liver edge was palpable. The anaemia was more marked than at his previous admission to hospital ; red cells 3½ million of macrocytic type, white 13,000, haemoglobin 68 per cent., blood calcium still normal. He gave a history of " faecal vomiting." The diagnosis was thought to rest between idiopathic steatorrhoea [*i.e.*, non-tropical sprue], or abdominal tuberculosis or neoplasm. Ascites increased and recurred repeatedly after paracentesis. Operation was undertaken and a carcinoma of the hepatic flexure of the colon was found. The patient died and at autopsy a large growth of the flexure was observed to have ulcerated through to the duodenum. Other cases, in several points similar to this, are referred to by the authors [see also this *Bulletin*, 1930, Vol. 27, p. 1024 ; 1932, Vol. 29, p. 463]. *H. H. S.*

Rominger (E.) & Bomskov (C.). Untersuchungen an hyperchromen Anämien bei experimentell erzeugten sprueartigen Erkrankungen. [**Hyperchromic Anaemia in Sprue-like Conditions experimentally produced.**]—*Klin. Woch.* 1935. Feb. 2. Vol. 14. No. 5. pp. 148–150.

The authors claim to have brought about anaemia of the chlorotic type in young, growing white rats by feeding them with cows' milk, and of the pernicious type by feeding with goats' milk. The former they ascribe to deficiency in iron or copper since it is curable by exhibiting these metals ; the latter, they maintain, is identical with pernicious anaemia in man because it is refractory to iron but susceptible to liver treatment.

The symptoms resulting from feeding the rats on goats' milk were : " fatty stools, pernicious anaemia, lipaemia and the nervous disturbances corresponding to the picture of sprue." The red cells were reduced to about a million [the normal for rats is not stated], the colour index was 1·3 ; there was definite leucopenia with relative lymphocytosis. Anisocytosis, poikilocytosis and polychromasia were marked and megaloblasts and normoblasts numerous. [It is not stated whether the anaemia was of the megalocytic type.] The lipaemia was marked and the blood sugar reduced by half. The " nervous symptoms " comprised muscular weakness, stiffness of limbs and even paralysis, with a " definite crab-like gait."

The authors call this symptom-complex " Rat sprue " and discuss its causation ; whether it is parasitic, infective or toxic in origin or a deficiency disease, and they lean to the idea that it arises from absence or deficiency of the " anti-anaemic factor of vitamin B_2 " and failure of adequate absorption from the intestine of the " blood regenerating factor," in the course of the fatty diarrhoea brought about by feeding with goats' milk. [The article contains too many suppositions, and sprue in man is not characterized by paralysis or a crab-like gait.]

H. H. S.

Weise (W.). Sammelbericht ueber Sprue.—*Arch. f. Schiffs- u. Trop.-Hyg.* 1935. Oct. Vol. 39. No. 10. pp. 425–432. [Numerous refs.]

MISCELLANEOUS.

DE LANGEN (C. D.). **Geographical Pathology.**—Reprinted from *A Clinical Text-Book of Tropical Medicine.* pp. 479–513. 1935. Batavia-C.-Surabaya-Amsterdam. G. Kolff & Co.

This is an excerpt from a Text-Book of Tropical Medicine and aims at discussing the general diseases which are practically universal, pointing out the special features which characterize them when occurring in tropical countries. Geographical pathology is a most absorbing subject, worthy of a whole volume to itself, and cannot be adequately treated in a chapter of 35 pages. The order of treatment is arbitrary, *viz.* gastric conditions, ulcer and carcinoma, then liver diseases, cirrhosis, primary carcinoma and cholelithiasis, the anaemias and cardio-vascular disorders, tuberculosis, pneumonia, renal affections, glycosuria and diabetes, gout and specific fevers. The rarity of gastric ulcer in the tropics is noted; under the anaemias it is stated that macrocytic anaemia is " in no way akin to the anaemia of sprue or pernicious anaemia " and that " sprue is regarded as a typical tropical disease." Sprue anaemia is of the macrocytic type and the differences should be noted between it and other forms if held to be " in no way akin." Nothing is said of the so-called non-tropical sprue which should assuredly find a place in work on geographical pathology. The author's experience of tuberculosis in the tropics differs from that of those practising in other parts of the tropics. Thus, he states that haemoptysis is a symptom which is present with extraordinary frequency and that it is severe and not unusually fatal. " These findings are confirmed from all other tropical lands," he states. On the contrary SCOTT has noted among his series of Chinese in Hong Kong that he only found three deaths from haemoptysis, all adults, and that " no case was found among the far larger number of children " and he adds " It would seem that this condition does not occur in the ' natural ' disease, only in the ' modified ' " and tuberculosis in the tropics is in his experience largely of the natural type as opposed to the modified. The remarks on the chief infective diseases, diphtheria, scarlet fever and measles consist of brief generalizations. It is nowhere stated that the author's remarks apply only to Netherland India and if he is giving his experience of that country only he is taking a very limited view of so vast a subject as tropical geographical pathology. *H. H. S.*

RADSMA (W.). Enkele physiologische verschillen tusschen Europeesche en inheemsche bevolkingsgroepen te Batavia. [**Physiological Differences between Europeans and the Indigenous Population of Batavia.**]—*Nederl. Tijdschr. v. Geneesk.* 1935. June 22. Vol. 79. No. 25. pp. 3066–3084. With 3 figs. [25 refs.] English summary.

The English summary is as follows :—

" In the first communication of this series we described some differences which have been found in the chemical composition of the blood and the acid-base equilibrium between different European and native groups of population in Batavia.

" Distinct differences were found especially between the poorer natives (servants and coolies) and the European population. The haemoglobin content, the content of cholesterol and other lipoids was lower with the

poorer natives than with the Europeans, while with the better situated natives (students) the content of lipoids in the blood was about the same as with the Europeans, the content of haemoglobin somewhat higher. The amount of non-protein nitrogen and of glucose was lower with the natives than with the Europeans.

"As for the acid-base equilibrium, a distinct difference proved to exist between the occurrence of morning-alkaliuria with Europeans and native servants. With Europeans morning-alkaliuria often occurred, with the servants practically never. The results of measurements in the 24-hours urine point to a more acidotic metabolism with the servants, caused by a relatively smaller amount of fixed bases in their food. With the students the results mostly lay between those with the servants and with the Europeans. The blood of the native servants proved to be more acid than that of the Europeans.

" In this second communication the probable causes of the differences are discussed."

McEwen (O. R.). **Salt Loss as a Common Cause of Ill-Health in Hot Climates.** [Correspondence.]—*Lancet.* 1935. Apr. 27. p. 1015.
Langdon-Brown (W.). **Salt Loss as a Cause of Ill-Health.** [Correspondence.]—*Ibid.* May 4. p. 1069.

The loss of fluid by miners and stokers working at high temperatures and the relief of resulting symptoms by the drinking of saline fluid are well recognized. Col. McEwen believes that the ill-health and loss of efficiency in the white inhabitants of tropical regions in the hot season is due to the same cause, *viz.*, a loss of sodium chloride.

Hunt estimated the loss of fluid in the hot weather in India as 30 pints per diem. McEwen from experience in the Punjab and North West Frontier Province puts it at 12 pints with light exercise. If then the proportion of NaCl in the sweat is put as low as 0·3 per cent. (Yas Kuno) there would be lost in 12 pints " some 16 gm. a day [should not this be 21·6 gm. ?]." Adding 12 gm. passed daily in the urine, and 4 gm. as necessary for bodily metabolism, we have a total requirement of 32 gm., and if we take 15–20 gm. as the amount taken in food there is a deficit of some 12–17 gm. daily, which might be doubled in certain conditions. Many Europeans never feel well in the really hot weather, complaining of undue fatigue, lassitude, headache, sleeplessness and inability to concentrate. McEwen himself has reduced the incidence of these symptoms by increasing his intake of NaCl and he advises the drinking of physiological salt solution at full or lesser strength. Other means of increasing the salt intake are mentioned.

Sir W. Langdon-Brown refers to " functional hypo-adrenalism " as a severe form of the condition McEwen describes. In these cases cortical extract is prescribed but perhaps salt would do as well. In this type of case achlorhydria is found, which would be explained by salt deprivation.

A. G. B.

Culpin (Millais). **Neurasthenia in the Tropics.**—Reprinted from *Practitioner.* 1935. Aug. Vol. 135. pp. 146–154.

After tracing briefly the history of the recognition of those conditions which later became known collectively as the psychoneuroses, the author gives reasons for suggesting that they would be better included under the designation " Benign psychoses " and that the word neurasthenia should disappear.

Having thus defined the subject of his article Millais Culpin then proceeds to show "that there is no specific condition attributable to the tropics"—no such thing as "tropical neurasthenia." He believes that the symptoms of the condition arising in the tropics differ in no way from those presented in the benign psychoses in Great Britain and other temperate countries and that both are due to the same psychogenic factors though some of the conditions associated with life in the tropics—"climate, conditions of service, worry and the like can pull the trigger" and precipitate the "nervous breakdown."

That a large number of persons are invalided from the tropics with "neurasthenia" is well known. The point is made that among these are many who were the subjects of some neurotic or temperamental infirmity before going abroad and a certain number who had "actually availed themselves of the opportunity of going abroad as a flight from the strain of social life at home."

"The problem of reducing the incidence of 'tropical neurasthenia' is . . . not very different from similar problems at home." A study of individual cases would yield systematic information upon these cases and further inform us "what are the actual conditions that in specific cases have precipitated the breakdown," and "what kind of man tends towards breakdown."

Only thus armed, with a knowledge of all the factors involved and with the power to assess the qualities which may be expected to play a part in the production of breakdown, is the medical man able to advise properly upon candidates for tropical service. The same knowledge is essential in the medical officer abroad where recognition of the nature of these disorders and an informed investigation into individual cases would go far to reduce absenteeism from this cause.

H. S. Stannus.

Castronuovo (Giovanni). Irritabilità, psicosi e neuropatie tropicali. [**Tropical Psychoses.**]—*Riforma Med.* 1935. Aug. 3. Vol. 51. No. 31. pp. 1180–1182.

This article is one of great interest, dealing briefly with various psychoses which are observable in warm climates. The information given is very condensed, but is one of the best summaries within the reviewer's knowledge. The author treats first with mere states of irritability and the milder psychoses, often denominated tropical neurasthenia, such as hypochondriacal nostalgia, abulia, Sudanitis, Biskritis, Punjab head, states of anxiety, and so forth (see this *Bulletin*, 1933, Vol. 30, p. 802). He then mentions those forms which occur with definite disease, *e.g.*, the psychoses of pellagra and passes on to speak in more detail of the graver forms such as *amok* with its hallucinations and tendency to homicide; *uas-uas* with its melancholic depression, palpitation, paraesthesiae in the form of pruritus, formication, and phobias, as met with in Tripolitania; *latah*, an imitative psychosis, commonest in Malaya and in Northern Africa; *koro*, in the Celebes, an anxiety state with a "castration phobia" which is intense (see the following abstract); *kubisagari*, the transient paralysis with vertigo, in Japan; it affects commonly the neck muscles and the name means "man with a falling neck." Other psychoses mentioned are transient apoplectic or syncopal attacks in the young, epileptiform convulsions and certain neuropathies described by

ALEXANDER & WU (*Chinese Medical Journal*, 1934) as associated with dysentery. The article should be consulted in the original by those interested in these nerve-states. *H. H. S.*

PALTHE (P. M. van Wulfften). Koro. Een eigenaardige angstneurose. [**Koro, a Peculiar Anxiety Neurosis.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1934. Dec. 25. Vol. 74. No. 26. pp. 1713–1720. With 4 figs. (2 on 1 plate).

SLOT (J. A.). Koro in Zuid-Celebes. [**Koro in South Celebes.**]—*Ibid.* 1935. May 14. Vol. 75. No. 10. pp. 811–820. With 2 figs. English summary.

PALTHE (P. M. van Wulfften). Aanvulling op het artikel "Koro, een eigenaardig angstneurose." [**Supplementary Note.**]—*Ibid.* pp. 836–837.

MULDER (J. G. A.). Over Koro. [**Koro.**]—*Ibid.* pp. 837–838.

The publication of the first of these articles brought out, in a subsequent number of the same journal, other accounts of the neurosis which is here described as Koro. This name, which signifies shrivelling, is, of course, native and is used by Macassars or Buginese (South Celebes). It is a well-known affection also among Chinese under the name Shook Jong and was first described by Blonk in 1895. The article in MENSE's Tropical Handbook (1905) by Brero refers to it, and yet many practitioners in the tropics have never seen or heard of it. Blonk described it as an illness in which, at irregular intervals, the feeling arose that the penis was retracting into the abdomen. If then timely help was not forthcoming death followed. The condition is greatly feared. The sufferer in his anxiety takes the penis forcibly in the hand or, if not himself able to do so, is assisted by others. It may be days before the attack subsides and a Koro sufferer during the attack will not want to be left alone. Should it so happen that the attack comes on and help is not at hand the patient may tie the penis with string to the leg or he may have in readiness a double-bladed clasping instrument, called Li Teng Hok, which is ordinarily used by jewellers for weighing operations. After the attack is over the patient feels greatly exhausted.

In terms of native thought this tendency of the penis to retract indicates that the "Yin" principle, representing the female power dominates the "Yang" principle, which is the representative of all that is male. "Yang" and "Yin" stand for heaven and earth, sun and moon, day and night, heat and cold, life and death, positive and negative, strong and weak. In order that Yin disease shall be cured Yang medicine must be given. Little real explanation of the disease can be given by natives. It is found in a definite region, occurs in a definite people, is a generally recognized belief in a sickness which everyone fears, but the feared consequences of which no one has seen. The disease is there because it must be. Thus runs the argument for a primitive folk belief.

The sufferers are apparently neurotics, who get attacks of anxiety and constraint sensation. The anxiety arises out of sexual conflicts. In this we may see the conception of a "castration complex" according to FREUD. As already said the disease occurs among the Chinese and yet in China even at the present day castration is not a relic of antiquity. It is a reality as a mode of punishment and for the production of eunuchs. It may involve loss of the penis as

well as the testes. The reality too of the belief that destruction of the genitalia signifies destruction of life is evident among the inhabitants of the Celebes region by the use of the method in attempts at suicide not only as a regression phenomenon in schizophrenics but as a deliberate cold-blooded action.

The investigation then of the disease Koro is evidently one of psychological and ethnological importance. As factors which may excite the fear of an attack may be mentioned conditions of oedema of the lower abdomen, hernia, hydrocele, or elephantiasis of the scrotum. In these the gradual disappearance of the penis may be regarded as essential shrivelling.

The disease, as is evident from the accounts given, is not confined to men. It is known to occur also in women with identical symptoms. In women the bodily symptoms are of diminution of the genital labia and shrinkage of the breasts.

A complete insight into the cause of this sickness cannot, it is thought, be obtained except by a psychoanalysis, an analysis by one of allied cognate psyche, that is to say of a Macassar by a Macassar. For the present the general term of an anxiety neurosis seems to be the most useful appellation.

As regards treatment the sufferer and his friends will probably apply the recognized treatment by fixation of the penis until the attack be over, but one at least of the authors was able to effect a cure by the administration of allonal for the night, a strong bromide draught next day and persuasion that the consequences feared were impossible. *W. F. Harvey.*

Napier (L. Everard) & Gupta (C. R. Das). **Haematological Studies in Indians. Part I. Haemoglobin Estimation Methods. Part II. Normal Standards for a Bengal Town Population: Part III. Normal Standards for a Tea-Garden Coolie Population.**—*Indian Jl. Med. Res.* 1935. Apr. Vol. 22. No. 4. pp. 809–825. With 1 graph & 1 chart; July. Vol. 23. No. 1. pp. 305–309; 311–316.

This article is on a subject of the utmost importance in clinical medicine and in work of a research nature on the blood. The authors deplore the present unsatisfactory method of recording the haemoglobin content as a percentage of a shifting standard and state that the obviously scientific way is to record the content in grams per 100 cc. of blood. The present confusion is made greater by the fact that the "normal" [*i.e.* the average content of a large number of apparently healthy adult males] on which the percentage is based is different in different races and countries, *e.g.* the British differs from the American normal.

In the present article the authors discuss and point out the advantages, disadvantages and fallacies of the various methods usually employed for estimating the haemoglobin content of blood. They are all colorimetric, such as (1) comparison of undiluted blood with a graduated colour standard, as Tallqvist or Dare's methods; (2) comparison of blood diluted to a fixed percentage with a coloured glass-wedge standard; in the Fleischl-Miescher sodium carbonate is the diluent, in the Hellige-Neoplan decinormal HCl; (3) diluted blood compared with a fixed colour standard, as picrocarmine (Gowers), Haldane's CO method; Sahli's acid haematin and so on.

The authors' investigations were made on normal Indians in Calcutta, normal tea-garden coolies in Assam and on anaemic persons in these localities. A very interesting account is given of the techniques of the methods employed and of the experimental errors which may be very considerable. These details would lose most of their value in attempts to abstract them and the original must be referred to by those interested, that is by nearly every research worker in the tropics. The Tallqvist method used by many, probably because it is the easiest and simplest, had an experimental error as great as 11·8 per cent., the Hellige apparatus ± 1·4 per cent. or 0·19 gm. Hb. if specially selected tubes were used, otherwise it might be twice as great. They conclude that "provided the colour standard, the tubes and the pipettes of the Hellige haemoglobin apparatus are checked by some absolute method of haemoglobin estimation, it is a method that can be adopted for clinical purposes, or for obtaining scientific data under field conditions."

The authors are carrying out work of inestimable value in presenting this series of investigations, for they are pointing out fallacies in previous standards regarded as normal in blood constituents, clarifying discrepancies between different classes of persons, and if workers in other countries can be stimulated to research on similar lines a series of normals for different races, classes, climates, might be established departures from which might prove of valuable aid in diagnosis and in gauging the results of treatment of disease.

In Part II the authors, in order to determine the normal standards of haematological data for dwellers in a Bengal town, examined samples of blood from doctors, clerks, laboratory assistants and servants, members of the staff of the Calcutta School of Tropical Medicine, 50 in all. They have already shown that the Hb. content of venous blood is distinctly lower than that of capillary blood, and for these investigations extracted blood from a vein. A small drop was taken on a slide for halometric estimation and for differential leucocyte count, while for Hb. determination and for total red and white cell counts the blood was placed into tubes containing powdered potassium oxalate 2 mgm. per cc. blood. For reticulocyte and platelet counts a drop was taken directly from the finger on to a slide prepared with brilliant cresol blue.

The subjects were between 25 and 45 years of age, the majority between 30 and 40 years. The doctors, clerks and laboratory attendants were mostly Bengalis, the servants mostly Ooriyas; all had been living for some time in Calcutta. The clerks gave the highest Hb. figures, the servants the lowest. To test the influence of the food factor the subjects were divided into groups of strict vegetarians, those eating meat occasionally, those having fish daily and meat occasionally, and the regular meat eaters. The numbers in each were small, but among four in Group I the Hb. percentage was 101·7 and in a like number in Group IV it was 114·7; between 16 in I and II together and 27 in III and IV the difference was 6·3 per cent. The authors' findings of 14·7 gm. for men is below Sokhey's figure of 15·3; this may be accounted for by the fact that venous blood was tested. There is, thus, no evidence for the text-book statement that the Hb. percentage of the blood of Indians is usually lower than that of Europeans. Their eosinophile count of 450 per cmm. or 7 per cent. is above that for normal Europeans.

In Part III similar estimations were carried out to determine normal standards for tea-garden coolies nearly all of whom had lived for 10 years or longer on the garden. The study concerns 41 who must be regarded as "a sample of the clinically-non-anaemic population," not as a sample of the whole coolie population. The Hb. was only about 80 per cent. of that of members of the same race living under town conditions; the reticulocyte and eosinophile counts were markedly higher. It is probable from the latter findings that the coolies examined were not strictly normal and the lower Hb. percentage may be ascribable to some undiscovered pathological process. Six doctors and clerks working in this district were examined and their results closely resembled those of the town-dwellers given above.

H. H. S.

DHAR (Jyoti). **Haematological Studies in Indian Women (Part Three). A Preliminary Report on the Determination of the Differential Leucocyte Count in Eighty-Six Normal Bengali Women.**—*Calcutta Med. Jl.* 1935. Aug. Vol. 30. No. 2. pp. 65–90. With 2 figs. [42 refs.]

For the purposes of this investigation the author studied 86 young and apparently healthy Bengali women. Sixty-five were students of Ashutosh College, 12 of Bethune College, Calcutta, 5 selected healthy probationer hospital nurses and 4 healthy relatives of in-patients. The leucocyte counts only are dealt with. The following tables compiled from the information given in the paper will save long description.

Cell	Absolute counts per cmm.			Relative percentages		
	Min.	Max.	Average	Min.	Max.	Average
Neutrophile	1,625	9,994	3,679	46	79	64·8
Lymphocyte... ...	625	4,050	1,674	17	42	30·2
Large mononuclears	31	300	80	1	6	1·5
Eosinophile	31	656	170	1	12	3·2
Basophile	31	137	6	1	2	0·1

H. H. S.

POINDEXTER (Hildrus A.). **The Differential Blood Picture of a Group of Rural Inhabitants of Alabama.**—*Amer. Jl. Med. Sci.* 1935. Sept. Vol. 190. No. 3. pp. 416–423. [27 refs.]

Considerable interest has been aroused of late concerning haematology and standards for different types of persons, notably in India by NAPIER and DAS GUPTA (see above p. 75). The present article is a study carried out during a house-to-house investigation of the prevalence of syphilis, a determination of positive reactors to tuberculin, of those with malaria or intestinal parasites among coloured persons in Alabama.

The persons were arranged into five groups: I. Normal, with no indications of disease; II. Those with intestinal parasites, chiefly hookworm or ascaris; III. Those with malaria parasites; IV. Those reacting positively to tuberculin; V. A miscellaneous group giving a history or presenting symptoms of a condition usually associated with eosinophilia—asthma, hay fever, skin lesions, food sensitivity and such like.

In Group I were 401 between 5 and 34 years and 158 between 15 and 30 years. The neutrophiles ranged from 51·0 per cent. in children between 5 and 9 years to 64·0 at age 25–29 years, eosinophiles 12·7 at age 5–9 years, 5·9 at 30–34 years, lymphocytes between 22·8 and 28·3, monocytes 6·0 to 10·3, and basophiles 0 to 1·7 per cent. The percentages differed among those from 15–30 years as compared with figures previously recorded by R. J. NEEDLES from examining 100 nurses. The author's figures were as follows, those of NEEDLES being placed in brackets: neutrophiles 57·3 (70·0), lymphocytes 24·3 (24·6), monocytes 8·3 (3·2), eosinophiles 8·6 (1·7), basophiles 0·7 (0·5).

The Arneth count also differs; that of the normal negroes was 11·0, 17·6, 18·9, 7·6, 1·9 while among the normal nurses (NEEDLES's figures) it was 8·4, 22·9, 26·7, 8·7, and 3·2 respectively [so stated, but these are clearly not worked out as percentages and the totals differ and are therefore not strictly comparable].

In Group II there were 47 persons; neutrophiles varied between 48·1 and 62·6, eosinophiles between 12·5 and 21·7, monocytes 3·1 and 9·0, other differences were small. In the malaria group of 71 (Group III) neutrophiles varied from 53·9 to 62·1, eosinophiles 4·9 to 6·4, monocytes 6·8 to 10·6. Among 60 in Group IV the only marked variation was in eosinophiles 3·8 to 8·5 per cent. In the last group (Group V) there were 153; little would be gained by giving the limits here because the conditions causing eosinophilia are many and varied and they are not subdivided aetiologically in this article.

In his conclusions the author states that the differential leucocyte picture did "not correlate with that usually recorded in manuals as guides, and averages from more northern climates, and of persons of different occupations. The most consistent differences were a lower neutrophile percentage and a higher eosinophile and monocyte percentage. . . . The average number of granules in the eosinophiles was higher in those with the larger percentage of eosinophiles. The question of whether these differences are racial, meteorologic, occupational, nutritional . . . or a combination of these or other factors, is not answered." [It seems a pity that opportunity was not taken to estimate the haemoglobin of these natives as was done in India.]

H. H. S.

BUCHANAN (George). **Anaemia: Haematological Aspect.**—*South African Med. Jl.* 1935. Sept. 14. Vol. 9. No. 17. pp. 597–603. [10 refs.]

This paper has much of interest, but what will be of special interest to readers of this *Bulletin* are the introductory paragraphs giving the normal standards of the elements of the blood picture as found in the high veldt, at Johannesburg, 5,750 feet above sea-level. The blood pictures of pernicious anaemia, sprue (one case only), Diphyllobothrium anaemia, gastric carcinoma, haemolytic and post-haemorrhagic anaemias have been recorded often and are text-book knowledge and these will not be further spoken of here. The normal standards, however, are of the greatest value for comparison with those recorded in India, by NAPIER and Das GUPTA, DHAR and others, and America by POINDEXTER (see above).

Examination of the blood of 35 healthy adult males, between 20 and 40 years of age, revealed an average erythrocyte count of 6,120,000 per cmm.; of 16 females 5,440,000 per cmm. In only a few healthy

subjects has the author estimated the haemoglobin; he found an average of 15 gm. per 100 cc. [More work is needed here, as in almost every part of the world, before the local standard can be established. This is a study which could be carried out in the many Colonial laboratories with very little difficulty, but one which would be of the greatest value.] *H. H. S.*

JETTMAR (H. M.). Küchenschaben als Krankheitsueberträger. [**Cockroaches as Vectors of Disease.**]—*Wien. Klin. Woch.* 1935. Vol. 48. No. 20. pp. 700–704. With 3 figs. [Summarized in *Rev. Applied Entom.* Ser. B. 1935. Sept. Vol. 23. Pt. 9. pp. 212–213.] [Summary appears also in *Bulletin of Hygiene.*]

"Few papers have been published on the part played by cockroaches in disseminating disease. After referring to Toda's investigation on *Blattella* (*Phyllodromia*) *germanica*, L., as a possible vector of cholera vibrios, the author records his own observations. In Manchuria and Transbaikalia, *B. germanica* was exceedingly common and overran the bodies of men who had died of plague, feeding on the infected secretions. In experiments, examples of this cockroach lived and reproduced for over a month, during which they were fed exclusively on plague-infected material. Their excreta contained the bacilli in a weakened form, usually incapable of infecting guineapigs by inoculation. After prolonged feeding on infected material, the cockroaches developed in the intestine an active bacteriophage against the bacilli of plague and Asiatic cholera. In view of the occurrence of *B. germanica* and *Blatta* (*Periplaneta*) *orientalis*, L., in a hospital, a number of experiments, here described briefly, were made to test the flora of their intestinal contents. It was found that infected cockroaches were able to carry viable, pathogenic streptococci, and that for weeks after the infective feed the excreta contained these organisms in a viable and highly virulent condition. Cockroaches should therefore be kept away from all places where perfect asepsis is necessary. Soiled bandages, etc., should be at once immersed in disinfectant and not stored in pails until burned. As cockroaches are never found in cold storage chambers, bodies and organs can be safely kept there."

LWOFF (Marguerite). Le pouvoir de synthèse des trypanosomides des culicides. [**The Synthetic Action of Culicine Flagellates.**]—*C. R. Soc. Biol.* 1935. Vol. 119. No. 24. pp. 969–971.

Amongst the flagellates isolated in culture from insects by NOGUCHI and TILDEN (1926) was one form called by them *Leptomonas culicidarum*. It was isolated from both *Anopheles quadrimaculatus* and *Culex pipiens*. The flagellate was subsequently transferred to the genus *Strigomonas* (Lwoff) by THOMSON and ROBERTSON. The author of the present paper now points out that the culicine form has the power of synthesizing protohemine, while the anopheline form has not this power. This property of the culicine form is shared by the plant flagellate *S. oncopelti* and all free-living protozoa so far investigated. It seems to indicate that the culicine flagellate is a more primitive one than the anopheline form. *C. M. Wenyon.*

KRISHNAN (K. V.), CHOPRA (R. N.) & MUKHERJEE (S. N.). **Contributions to Protozoal Immunity. Part III. The Rôle of Electrical Charge in the Phagocytosis of Red Cells.**—*Indian Jl. Med. Res.* 1935. July. Vol. 23. No. 1. pp. 253–262. [11 refs.]

From a study of the migration rate of the red blood corpuscles in an electric field it has been found that in monkey malaria (*P. knowlesi*) the

uninfected cells in general move faster and hence have a greater electric charge than the infected cells, the charge of which, however, decreases with the growth of the parasite. The reticulocytes behave as normal cells some of which, however, in infected blood have an increased density of charge which is due to some undetermined factor. It would seem that in phagocytosis the medium itself plays an important part.

C. M. W.

Kofoid (C. A.), McNeil (E.) & Bonestell (A. E.). **A Comparison of the Distribution of the Intestinal Protozoa of the Norway Rat, Wood Rat, and Guinea Pig with Reference to the Hydrogen Ion Concentrations as determined by the Glass Electrode.**—*Univ. California Public. Zoöl.* 1935. Vol. 41. No. 1. pp. 1–8.

As the title indicates, the distribution of certain protozoa in the intestine of the animals mentioned was studied, while at the same time the pH of the intestinal contents was taken at different levels so as to throw light on the range of pH tolerated by the protozoa.

C. M. W.

Brumpt (E.) & Lavier (G.). Sur une *Nucleophaga* parasite d'*Endolimax nana*. [**Nucleophaga, a Parasite of** *Endolimax nana*.]—*Ann. Parasit. Humaine et Comparée.* 1935. Sept. 1. Vol. 13. No. 5. pp. 439–444. With 1 plate.

Parasites in the cytoplasm of various intestinal protozoa, having the appearance of large cocci within a vacuole, are fairly well known under the name of *Sphaerita*. It is less well known that a similar organism may parasitize the nuclei of intestinal amoebae and give rise to marked hypertrophy of the nucleus which has the appearance of being filled with cocci. The organism, which belongs to the genus *Nucleophaga*, was first seen in *Endolimax nana* and *Iodamoeba bütschlii* in 1921. In the following year Epstein saw it in the nucleus of *E. nana* and named it *Nucleophaga hypertrophica*, while later still Brug (1926) gave the name *N. intestinalis* to the form seen by him in *I. bütschlii*. In the present paper the author, who has seen the parasite in large numbers in a heavy infection of *E. nana*, redescribes and figures it. He comes to the conclusion that in the parasitic amoebae one species alone occurs which should bear the name *Nucleophaga hypertrophica* Epstein, 1922. The same individual harboured also *Entamoeba dispar* (*E. histolytica*) which was parasitized by *Sphaerita* but not by *Nucleophaga*.

C. M. W.

Giemsa (G.). Die Romanowsky-Färbung protozoischer Blutparasiten in alten Trockenausstrichen. [**Staining of Parasites in Dry Blood Films.**]—*Zent. f. Bakt.* I. Abt. Orig. 1935. Sept. 5. Vol. 134. No. 7/8. pp. 483–486.

The author discusses the possibility of obtaining a satisfactory method of staining old blood films with Giemsa stain. He concludes that this can only be done if the films without fixation have been stored in a perfectly dry atmosphere over calcium chloride. Films so stored have been stained well after 28 years, by using the customary solution, *viz.*, 10 drops of stain to 10 cc. of water (buffered and at a pH of 7·2 to 7·5 according to the age of the film).

C. M. W.

MENON (T. Bhaskara) & KRISHNASWAMI (T. K.). **The Nature of the Donovan Body of** *Granuloma inguinale.*—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1935. June 29. Vol. 29. No. 1. pp. 65–72. With 1 plate. [14 refs.]

The Donovan bodies met with in granuloma inguinale appear to be small intracellular Gram-negative bacilli which during division give the appearance of bipolar staining and diplococci. *C. M. W.*

MALAMOS (B.). Grahamellen beim Affen. [**Grahamella in the Monkey.**]—*Zent. f. Bakt.* I. Abt. Orig. 1935. June 14. Vol. 134. No. 3/4. pp. 152–153. With 1 fig.

In the blood of a West African monkey, *Cercopithecus mona*, which had been experimentally infected with *Plasmodium knowlesi*, rendered immune to this infection and subjected to splenectomy, a scanty infection of the red blood corpuscles with a *Grahamella* was discovered. Whether this represents a new species (*G. cercopitheci* n. sp., as distinct from *G. rhesi* described by A. Léger in 1922) future work alone will show. It seems possible that in this case the monkey contracted an accidental infection from one of the smaller rodents. *C. M. W.*

SAMUEL (J.). **Rengas Poisoning.**—*Malayan Med. Jl.* 1935. Mar. Vol. 10. No. 1. pp. 14–15. With 4 figs.

Rengas poisoning is due to the sap of *Gluta rhengas* L. (N.O. Anacardiaceae) or an allied tree, is found among estate labourers, gardeners and woodcutters in Malaya and is attended by acute dermatitis and constitutional symptoms. A case is described and figured.

A. G. B.

RAYMOND (W. D.). **A Note on Cases of Poisoning by** *Jatropha multifida*, **L.**—*East African Med. Jl.* 1935. May. Vol. 12. No. 2. pp. 57–58.

The author remarks that at least three cases of poisoning by the coral plant, *Jatropha multifida*, have been reported in Tanganyika, the symptoms being colic, cramps, thirst and a subnormal temperature; in one, a fatal case, vomiting of a black colour occurred. The author mentions two other species, *J. curcas* and *J. glandulifera*. [*J. curcas* is common in the West Indies and is known as Physic nut, *J. multifida* as French physic nut. The former grows rapidly and is used by the natives in Jamaica (and perhaps elsewhere) for fencing small compounds. The nuts are palatable and taste like sweet almond. It is a handsome plant; a good coloured illustration of *J. multifida* is given in BYAM and ARCHIBALD's Practice of Medicine in the Tropics, Vol. I. Another species, *J. gossipyfolia*, is known locally in the West Indies as Wild Cassava or Belly-ache bush. The seeds when eaten act as a gastro-intestinal irritant, something like croton. A fifth species *J. urens* also occurs in the West Indies; its leaves have stinging hairs which cause smarting, itching and general symptoms of flushing of the face, swelling of the lips, faintness; recovery is usually fairly rapid after ejection of the poison by vomiting.] *H. H. S.*

REVIEWS AND NOTICES.

SOUTH AFRICAN INSTITUTE FOR MEDICAL RESEARCH. **Annual Report for the Year ended 31st December, 1934** [LISTER (Spencer), Director].—92 pp. With 2 plates. Johannesburg: P.O. Box 1038.

There is little to say concerning the routine work of the Institute except that an enormous amount of very necessary investigation is done and at the Port Elizabeth Branch laboratory a large increase in the number of specimens was dealt with, 27 per cent. more than in the preceding year. These were all of a routine character, 95 per cent. bacteriological and pathological, 3 per cent. biochemical and 2 per cent. parasitological. Of these there is no need to speak in detail.

In the domain of Research each Department has contributed its quota. In that of Bacteriology mention may be made of pneumonia and the periodic adjustments which are necessary in the constitution of the prophylactic vaccine, and of the enquiry into the virulence of strains of *P. pestis*. Much work was done in the usual summer outbreak of plague. The Department of Industrial Hygiene carried out investigations on Silicosis and this was aided by the Pathological Department's research on the extraction of mineral residues from normal and from silicotic lungs and an experimental silicosis by intravenous inoculation of rabbits with suspensions of the mineral residues extracted from the lung of a patient with rapidly developed gross silicosis. In the Biochemical Department vitamin research was carried out, a study of the present diets in the mines, analyses of foodstuffs, consideration of alternative rations, study of nutritional deficiencies and so on. The Pathological Department, in addition to the work referred to above, carried out research on cancer and, in conjunction with the serum department under Dr. E. GRASSET, on the influence of snake venoms and anavenoms on animal tumours. The Malaria Research Station was moved from the Northern Transvaal to Natal and ultimately was established at Eshowe, Zululand.

Twenty-three papers, relating to the work done, have been published during the year by members of the staff. *H. H. S.*

DE RIVAS (Dámaso) [B.Sc.Biol., M.S., M.D., Ph.D.] in collaboration with Carlos T. DE RIVAS, B.A., M.D. **Clinical Parasitology and Tropical Medicine.**—367 pp. With 144 figs. & 1 coloured plate. 1935. London: Henry Kimpton, 263 High Holborn, W.C. [22*s.* 6*d.*]

In this book of 350 pages, an account is given of most of the animal parasites of man and of the more important tropical diseases. The type is large, the space is limited, and much of it is occupied by illustrations, with the unavoidable result that many subjects have had to be dealt with in a very summary manner. The morbid conditions caused by animal parasites, and the parasites themselves, are adequately described; but bacterial diseases, and those of uncertain causation, are rather crowded out. The authors evidently write from a large and practical experience; medical men who already have some knowledge of tropical medicine will find the book interesting and stimulating; but beginners will not find it very easy reading.

The early chapters give a general account of the nature of parasitism, the relations of parasites to their host, the metabolic disturbances

caused to the latter, and the effects of secondary bacterial infections ; some space, too, is given to the mental disorders caused by the presence of parasites in the body.

From their own experiments the authors have found that parasites, both Protozoa and Metazoa, are extremely susceptible to relatively small variations of temperature. *Entamoeba histolytica* is killed in 5–10 minutes by exposure to the temperature of 45°C. When kept in sealed capillary tubes at 5°–10°C., the amoebae remained alive for over 48 hours ; it appears therefore that, if material suspected to contain *Entamoeba* cannot be examined immediately, it is better to keep it on ice than at body temperature. Round worms and tapeworms of man and the dog were also killed in 5–10 minutes by exposure to 45°C. These facts suggested a method for the expulsion of parasites inhabiting the intestine. In dogs the application of heat (45°–47°C), for 10–15 minutes, by lavage with physiological salt solution, of the colon through a rectal tube, and of the upper intestine by means of a duodenal tube introduced through the mouth, caused no appreciable symptoms or pathological changes in the intestinal mucosa or other tissues of the animals. The authors consider that the anthelmintics in common use effect the expulsion of parasites chiefly through a toxic reaction on the part of the host, and by variations in the host's temperature. As is well known, it is a common occurrence for parasites to be passed during the course of acute infections, especially when accompanied by high fever. Experiments were made with many reputed anthelmintics, by direct exposure of the worms to solutions of the drugs ; the results were unsatisfactory, as no specific action on the parasites could be observed. The most effective direct parasiticide was found to be a hot mixture of equal parts by volume of a 30 per cent. solution of magnesium sulphate and glycerine. With this mixture, *Amoeba*, *Paramecium* and *Giardia* were killed in half to two minutes ; *Ancylostoma*, *Oxyurus* and *Trichinella* in 5–10 minutes, and *Dipylidium* in 3–5 minutes. The authors consider that the " intra-intestinal thermal method," which they use for the treatment of infection with intestinal parasites, is so superior to other forms of treatment that they have completely abandoned the use of ordinary anthelmintics. In over 1,000 cases, treated by this method, no serious complications have occurred, other than perspiration, nausea, colic, and, at times general weakness and headache, all of which conditions have yielded to simple treatment. In the case of tapeworms, the whole worm with the scolex intact is discharged. The technique of lavage through duodenal or rectal tubes is described at length ; it may have to be repeated several, even many, times ; thus, in a case of *Trichomonas* infection in an adult, 42 lavages were required for the complete eradication of the parasite.

The chapter on malaria gives a good account of the disease, but it is not long enough to deal sufficiently with some aspects of it. Emphasis is laid on the need for caution in the treatment of paresis by malarial infection, for which the authors consider that only a very limited number of paretics would be suitable ; they think that " such therapeutic measures remain in the domain of theoretical speculation, the final result of which awaits further confirmation."

There are a good many misprints in this book, and some instances of the incorrect use of zoological terms. Many of the illustrations are good, but most of those representing sections of diseased organs are not well reproduced. The book can be recommended as an instructive work by writers who think for themselves, and who have brought acute

and original minds to the subjects they discuss. They are no blind followers of authority, and very rightly prefer to base their opinions on their own experience and observation. They criticize frankly many of the commonly held optimistic views of the ease and success of the usual methods of treatment ; and they show that, although much has already been accomplished, there still remains much to be done for the elucidation of the aetiology and modes of transmission of parasitic and other tropical diseases. *H. J. Walton.*

FRÓES (Heitor P.). **Lições de clinica tropical. Vol. II. Livro II (3a Serie). Doenças ou afecções causadas por animais não parasitas prejudiciasis ao homem.** [Lectures in Tropical Medicine.]—pp. xi+ 238. With 83 figs. 1935. Bahia.

The first part of Vol. II of the system was reviewed a few months ago (see this *Bulletin*, Vol. 32, p. 603) and mention was then made of the fact that two years had elapsed since the first volume had appeared and a hope expressed that there might be a speeding up with future volumes. This is being done and the present volume follows the last at an interval of 3 months only. It covers a wide field and contains 10 lectures, most of which would probably have to be subdivided for class purposes. It deals generally with " diseases or affections caused by non-parasitic animals harmful to men." The first two chapters are concerned with arthropods ; one with diptera, phlebotomus, simulium, bees, wasps ; Coleoptera and vesiculating species of Paederus, with caterpillars (largarta de fôgo) and certain grasshoppers and crickets (as Jaquirinabóia). The second chapter treats of spiders, scorpions, centipedes, mites and ticks, and the third gives a short account of coelenterates, echinoderms, mollusca and crustacea. Next come 4 chapters on fish, including those inflicting direct injury, from diodon to sharks, those with poisonous spines, those poisonous as food, and harmful ones such as the electric eel. Two chapters are given up to description of poisonous snakes, the symptoms they produce and the treatment of snake bite, and a terminal chapter deals with " other non-parasitic animals injurious to man " and includes poisonous lizards, eagles, condors, saurians, tigers, a heterogeneous group. Since all this is comprised within 240 pages and there are 83 illustrations, several of them full-page, the information imparted is not detailed, but doubtless in practice the delivery of the lectures is supplemented. The work is well documented. *H. H. S.*

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